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% WATER RESOURCES ABSTRACTS



VOLUME 5, NUMBER 21 NOVEMBER 1, 1972 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior



VOLUME 5, NUMBER 21 NOVEMBER 1, 1972

W72-12389 -- W72-13088

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Rioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Resources Research U.S. Department of the Interior Washington, D. C. 20240

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SELECTED WATER RESOURCES ABSTRACTS

02. WATER CYCLE

2A. General

A PROGRAM FOR ESTIMATING RUNOFF FROM INDIANA WATERSHEDS PART II. AS-SEMBLY OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA, Purdue Univ. Lafayette, Ind. Water Resources

Purdue Univ., Lafayette, Ind. Water Resources Research Center.
M. T. Lee, D. Blank, and J. W. Delleur.
Available from the National Technical Information Service as PB-211 543, \$3.00 in paper copy, \$0.95 in microfiche. Purdue University Water Resources Research Center Technical Report No 23, p 29 May 1972. 15 fig, 2 tab, 27 ref, append. OWRR-B-008-IND (8).

Descriptors: "Hydrologic data, "Rainfall-runoff relationships, "Drainage patterns, "Topography, "Geomorphology, Data storage and retrieval, "Watersheds, Hydrographs, Networks, Model studies, Indiana, "Small watersheds. Identifiers: Geomorphologic data, Data bank, Drainage network, Stream network.

Banks of hydrologic and geomorphologic data are presented for Indiana small watersheds and some applications of these data are discussed. Four major types of data were collected. They are: the appications of these data are discussed. Four major types of data were collected. They are: the rainfall, and the runoff data which were collected for 55 watersheds, and the drainage networks and the topography data which were collected for 34 of these watersheds. The data were recorded first on computer cards. They were printed, plotted and checked. Then they were loaded on four different magnetic tapes. The first contains the single storm rainfall excesses and the direct runoffs. The second contains the single storm rainfalls and the runoff hydrographs. The third contains the planform of the stream networks. The fourth contains the elevation contours of the watersheds. These data banks are useful in hydrograph analysis, estimation of instantaneous hydrographs, and identification and calibration of hydrologic models for runoff estimation. They have potential applications in drainage design, and development and management of water resources in general.

OCEANIC PART OF THE HYDROLOGICAL

CYCLE, T. Laevastu, L. Clarke, and P. M. Wolff. World Meteorological Organization Reports on WMO/IHD Projects, Report No 11, 1969. 71 p, 9

Descriptors: *Hydrologic cycle, *Evaporation, *Precipitation (Atmospheric), *Hydrologic budget, *Oceans, Sea water, Atmosphere, Weather patterns, Meteorology, Weather forecasting, Reviews, Synoptic analysis, Transfer, International Hydrological Decade. Identifiers: Water vapor transport.

The present state of knowledge of evaporation and precipitation at sea and the transport of moisture from the oceans to the continents is reviewed, with emphasis on the practical aspects of the oceanic part of the cycle. Formulas for computation of evaporation are presented and examples of synoptic and climatological evaporation charts are given. Precipitation at sea is discussed mainly from a climatological point of view. The discussion of the transport of water vapor across the continental boundaries reviews briefly the source regions, amounts, and seasonal variations. The possibilities of extended hydrometeorological and hydrological forecasts and outlooks are outlined. The gaps in knowledge of the oceanic part of the hydrological cycle are listed for stimulation of further research. (Knapp-USGS) The present state of knowledge of evaporation and

HYDROLOGY OF MOUNTAIN RIVERS (VOPROSY GIDROLOGII GORNYKH REK.), Zakavkazkii Naucho-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR). For primary bibliographic entry see Field 02E. W72-12434

THE EFFECT OF FORESTS ON THE WATER BALANCE OF DRAINAGE BASINS,
Ukrainskii Nauchno-Issledovatelskii Gidro-Meteorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 04C.
W72-12442

LITTER PRODUCTION BY OAK-MOUNTAI-NMAHOGANY CHAPARRAL IN CENTRAL

Forest Service, (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station. C. P. Pase.
USDA Forest Service Research Note RM-214,

1972, 7 p., 5 fig.

Descriptors: *Litter, *Chaparral, *Watershed management, *Biomass, Retention, Brush, Oak management, *Biomass, Retention, Brusa, vantrees, *Arizona.

Identifiers: *Forest floor, Mountainmahogany,

Annual litter fall from shrub live oak was 192 g/m2 crown area on southerly slopes, and 138 g on northerly slopes. For the chaparral community as a whole, southerly aspects produced 193 g/m2 crown areas and northerly aspects, 215 g. Most litter fell during late spring and early summer, least in fall and early winter. Forest floor varied from 9.2 to 27.1 metric tons per ha. Maximum water retained against free drainage was 4.8 mm under shrub live oak and 5.1 mm under Pringle manzanita. (Pase-Forest) W72-12812 Annual litter fall from shrub live oak was 192 g/m2 W72-12812

HYDROLOGIC BUDGET OF THE POUDRE

VALLEY, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

M.S. Thesis, 1971, 235 p. 13 tab, 23 fig, 124 ref. OWRR B-043-COLO (1).

Descriptors: *Hydrologic budget, *Irrigation operation and maintenance, *Water management (Applied), *Water demand, *Model studies, *Colorado, Irrigation canals, Ir-*Colorado, Irrigated lands, Irrigation canals, Irrigation water, Water utilization, Return flow, Reservoirs, Groundwater mining, Water transfer, Farm management, Surveys, Aerial photography, Mapping, Classification, Computer programs, Diversions, Water shortage, Water conveyance, Surplus water, Consumptive use. Identifiers: *Cache la Poudre Valley (Colorado).

Uncoordinated construction of privately financed irrigation facilities in the Cache la Poudre Valley has a very large impact upon the agricultural economy of Colorado. The very high utilization of return flows, interconnected regulatory surface return flows, interconnected regulatory surface storage facilities, groundwater mining and an exchange system characterized by duplication of facilities and inefficient operation. A water-related land use survey was made of the irrigated section of the valley, including aerial photography, map preparation, categorization and breakdown into canal systems. A hydrologic budget was pro-grammed involving irrigated lands and quantitative effects of water diversions under conveyance and effects of water diversions under conveyance and application efficiencies. Irrigation demand, water surpluses, and deficits were computed for each canal on a mean monthly and mean annual basis. Crop requirements are being adequately met, with some local areal deficiency and surplus. (Popkin-Arizona) 72-12822

2B. Precipitation

A SYNOPTIC CLIMATOLOGY FOR SNOWSTORMS IN NORTHWESTERN NEVADA, National Weather Service, Reno, Nev. Weather Service Office.
For primary bibliographic entry see Field 02C.
W72-12432

DISTRIBUTION AND VARIABILITY OF ANNUAL PRECIPITATION ON THE KOLKHIDA LOWLAND (RASPREDELENIYE I IZMENCHIVOST' GODOVYKH OSADKOV NA TERRITORII KOLKHIDSKOY NIZMENNOSTI), Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR). For primary bibliographic entry see Field 62E. W72-12437

METEOROLOGICAL EFFECTS OF THE HEAT AND MOISTURE PRODUCED BY MAN, National Oceanic and Atmospheric Administra-tion, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. For primary bibliographic entry see Field 05A. W72-12464

CLIMATOLOGY-AN OLD DISCIPLINE FACES A DYNAMIC FUTURE, Delaware Univ., Newark. Dept. of Geography. J. R. Mather. Professional Geographer, Vol 24, No 2, p 137-141,

Descriptors: *Climatology, *Application methods, *Planning, Climatic data.

Identifiers: *Applied climatology, *Multidiscipli-

nary studies.

Applied climatology is the scientific analysis of a statistical collective of individual weather conditions directed toward a useful application for an operational purpose. Although the discipline has a long and illustrious history, it really came into its own during World War II, when climatic information and interpretation was so important for strategic purposes. Since then, the real developments have been related almost entirely to weather forecasting and weather modification rather than to the development of possibly more useful applications for operational purposes. Applied climatology is a multidisciplinary field cutting across many of the bounds of traditional geography. Two examples of the wide range of applications are given: Thornthwaite's use of climatic schedules for irrigated crop planting purposes in Seabrook, N.J., and the work of the Olgyays in championing the idea of adjusting house design and orientation to climatic potentials. It is felt that the field has a promising and useful future. (Casey-Arizona)

ON THE MEDITERRANEAN CLIMATIC REGIME OF WEST PAKISTAN, Institut Francais, Pondichery (India). V. M. Meher-Homji. Archiv fur Meteorologie, Geophysik und Bioklimatologie, Series B: Climatology, Bioclimatology, Radiation Research, Vol 19, No 3, p 277-286, 1971. 3 fig. 3 th. 11 cef.

3 fig. 3 tab. 11 ref.

Descriptors: *Rainfall, *Seasonal, *Climatic zones, *Arid lands, Climatic data, Mapping, Geo-graphical regions, Statistical analysis, Foreign lands. Identifiers: *Mediterranean climates, *Climatic classification, *Coefficient of variation.

The Indo-Pakistan subcontinent contains a number of rainfall regimes: tropical, tropical dis-symetric, bixeric, irregular, axeric, and Mediter-

Group 2B—Precipitation

ranean. The latter climate is defined as one having a mild, rainy winter in which crop growth is not in-hibited. The intensity of estival dryness deter-mines the degree of Mediterraneity. Three categories are mapped: pure mediterranean (no summer rainfall), attenuated mediterraneity (greater than 40% rainfall in the hot season) and moderate mediterraneity (less than 40% summer rain on the average). Using the coefficient of variation of rais average). Using the coefficient of variation of rainfall and the numbers of rainy days during cool seasons and hot seasons, the various rainfall regimes are recognized and geographically mapped. Various transitional regimes are discussed. (Casey-Arizona) W72-12510

DISTRIBUTION OF TOTAL DAILY AT-MOSPHERIC PRECIPITATION AND ITS EF-FECTIVENESS (RASPREDELENIYE AT-MOSFERNYKH OSADKOV PO SUTOCHNYM SUMMAM I VOPROS OB IKH EFFEKTIV-NOSTI).

Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.

Pochvovedeniye, No 11, p 83-92, November 1971. 1 fig. 6 tab. 3 ref.

Descriptors: *Precipitation (Atmospheric), *Effective precipitation, *Rainfall disposition, *Distribution patterns, Soil-water-plant relationships, Root systems, Root zone, Soil moisture, Moisture content, Mositure availability, Evaporation, Seasonal, Variability, Geographical regions. Identifiers: *USSR, *European USSR, *Ukraine, Soil hydrology.

Calculation of the amount of precipitation occur-ring in the USSR during the warm season (April-September) in the form of daily precipitation amounts was based on data of 149 meteorological stations in 12 regions of the European USSR and 13 regions in the Asiatic part of the USSR, exclusive of mountain areas and the Siberian Far North. Twenty-four-hour precipitation less than 1 mm is Twenty-four-hour precipitation less than 1 mm is negligible, varying between 2% and 9% of the warm-season total and averaging only 4%. Daily precipitation amounts of less than 5 mm vary between 15% and 45% of the totals and average 29%. Twenty-four-hour precipitation in the 5- to 10-mm range varies between 19% and 31%, averaging 24%, and that in excess of 10 mm varies averaging 24%, and that it excess of 10 mm varies between 30% and 65%, averaging 47%. Effective-ness of precipitation is examined from both the hydrologic and biological standpoints. A daily amount of precipitation equal to daily evaporation is proposed as a conditional boundary between hydrologically effective and ineffective precipitation. Biologically effective precipitation must be judged on the basis of moisture content of upper soil layers and amount of small roots and root hairs in them. Only the amount of precipitation which is actually available to the root environment should be regarded as biologically effective. (Josefson-USGS) W72-12695

NITROGE, PHOSPHORUS, AND POTASSIUM CONTENT IN ATMOSPHERIC PRECIPITATION IN BELORUSSIA (POSTUPLENIYE AZOTA, FOSFORA I KALIYA S ATMOSFERNYMI OSADKAMI V BELORUSSII), Belorusskii Nauchno-Issledovatelskii Institut Pochvovedeniya i Agrokhimii, Minsk (USSR). I. A. Yushkevich, N. I. Turenkov, and I. A. Alekseychi Alekseychik. Pochvovedeniye, No 11, p 70-74, November 1971.

Descriptors: *Soil chemistry, *Precipitation (Atmospheric), *Nitrogen compounds, *Phosphorus, *Potassium, Meteorology, Weather, Rain, Rainfall intensity, Snow, Temperature, Average, Monthly, Seasonal, Annual.
Identifiers: *USSR, *Belorussia, *Nitrate

nitrogen, *Ammonia nitrogen.

Investigations were conducted in Kurasovshchina in southwest Minsk in 1965-70 and in nearby Shchemyslitsa in 1965-66 and 1968-69 to study the content) suisa in 1903-00 and 1968-69 to study the content of nitrogen, phosphorus, and potassium in atmospheric precipitation. Average annual precipitation in the region is 622 mm, of which about 75% is rain and about 25% solid and mixed precipitation. The nitrote private private in the content of the precipitation. precipitation. The nitrate nitrogen content in atmospheric precipitation depends mainly on rainfall intensity. Summer showers and steady autumn rains contain less nitrate nitrogen than light rains and snowfalls. The concentration of ammonia nitrogen is strongly affected by temperature and is higher in the precipitation of the warm season. The average monthly nitrate nitrogen content at Kurasovshchina during the period of observations varied between 0.22 mg/liter and 0.31 mg/liter. In the Kurasovshchina area, the average annual amount of bound nitrogen delivered to the soil with atmospheric precipitation was 6.45 kg/ha and in the Shchemyslitsa region, 5.43 kg/ha. The amount of phosphorus delivered to the soil by precipitation was small, averaging about 0.4 kg of P205/ha annually, regardless of the season. The K20 content in atmospheric precipitation depends on weather conditions and is highest in summer precipitation following dry and windy periods, decreasing considerably with the approach of fall humid weather and with the establishment of a snow cover. At Kurasovshchina, the average annual amount of K20 delivered to the soil by precipitation was 4.56 kg/ha and at Shchemyslitsa, it was 4.03 kg/ha, varying during individual years between 3.26 kg/ha and 6.11 kg/ha. (Josefson-USGS) W72-12696

FLORIDA CUMULUS SEEDING EXPERIMENT FOR DROUGHT MITIGATION, APRIL-MAY

National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Environmental Research

For primary bibliographic entry see Field 03B. W72-12705

PRECIPITATION SCAVENGING (1970). For primary bibliographic entry see Field 05B. W72-12752

RADAR OBSERVATIONS OF CONVECTIVE STORM CIRCULATION AND ITS RELATION TO PRECIPITATION SCAVENGING, National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Wave Propagation Lab. For primary bibliographic entry see Field 05B. W72-12753

SCAVENGING OF TRACER IN SEVERE STORMS.

Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 05B. W72-12754

INTERACTIONS OF CLOUD CONDENSATION NUCLEI AND ICE NUCLEI WITH CLOUD AND PRECIPITATION ELEMENTS: A REVIEW. Washington Univ., Seattle. Dept of Atmospheric Sciences. For primary bibliographic entry see Field 05B. W72-12755

ENTRY OF FREEZING NUCLEI INTO PRECIPITATION,
Wyoming Univ., Laramie. Natural Resources Research Inst. For primary bibliographic entry see Field 05B. W72-12756

IN-CLOUD SCAVENGING ANALYSIS FROM COSMOGENIC RADIONUCLIDE MEASURE-MENTS. Battelle-Pacific Northwest Labs., Richland,

Wash. For primary bibliographic entry see Field 05B. W72-12757

STABLE ELEMENTS OF THE ATMOSPHERE AS TRACERS OF PRECIPITATION SCAVENG-Battelle-Pacific Northwest Labs., Richland,

Wash. For primary bibliographic entry see Field 05B. W72-12758

CONCENTRATION VARIATION OF SOME TRACE METALS IN PRECIPITATION FROM GREAT PLAINS THUNDERSTORMS, Chadron Atmospheric Research Inst., Nebr. For primary bibliographic entry see Field 05B. W72-12759

SCAVENGING OF SOLUBLE DYE PARTICLES BY RAIN. Battelle-Pacific Northwest Labs. Richland, Wash.

For primary bibliographic entry see Field 05B. W72-12761

COLLECTION EFFICIENCIES OF RAINDROPS FOR SUBMICRON PARTICULATES, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 05B. W72-12762

COLLECTION EFFICIENCY OF WATER COLLECTION EFFICIENCY OF WATER DROPLETS IN AGCL AEROSOL,
Clarkson Coll. of Technology, Potsdam, N.Y.
Dept. of Chemistry; and Clarkson Coll. of Technology, Pottsdam, N.Y. Inst. of Colloid and Surface Science.
For primary bibliographic entry see Field 05B. W72-12763

COLLECTION EFFICIENCY IN WASHOUT BY

Berg (T. G. Owe), Inc., Garden Grove, Calif. For primary bibliographic entry see Field 05B. W72-12764

CONTINUOUS CHARGED CLOUD-PARTICLE SAMPLER, Manchester Univ. (England). Dept. of Physics. For primary bibliographic entry see Field 05B. W72-12766

PULSED-LASER HOLOGRAPHY FOR ANALY-SIS OF PARTICLE SIZE AND DISTRIBUTION, Battelle-Pacific Northwest Labs., Richland Wash. For primary bibliographic entry see Field 05B. W72-12767

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Missouri Univ., Rolla. Graduate Center for Cloud Physics Research.
For primary bibliographic entry see Field 05B. W72-12768

AUTOMATIC SEQUENTIAL RAIN SAMPLER FOR SCAVENGING STUDIES, Argonne National Lab., Ill. Radiological Physics For primary bibliographic entry see Field 05B. W72-12769

EFFECTS OF SOLUBILITIES OF GASES ON THEIR SCAVENGING BY RAINDROPS, Battelle-Pacific Northwest Labs., Richland, Wash. For primary bibliographic entry see Field 05B. W72-12770

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LABORATORY INVESTIGATIONS ON WASHOUT OF TRACE GASES, Frankfurt Univ. (West Germany). Institut fuer Meteorologie und Geophysik. For primary bibliographic entry see Field 05B. W72-12771

EUROPEAN INTEREST IN ACIDIC PRECIPITATION: A REVIEW, Battelle Memorial Inst., Seattle, Wash. Research For primary bibliographic entry see Field 05B. W72-12773

SCAVENGING OF SO2 BY CONVECTIVE STORMS, Research Council of Alberta, Edmonton. For primary bibliographic entry see Field 05B. W72-12775

THEORY OF DIFFUSIVE AND IMPACTIVE SCAVENGING, North American Rockwell Corp., Thousand Oaks, Calif. Science Center. For primary bibliographic entry see Field 05B. W72-12778

ATTACHMENT OF TRACE SUBSTANCES ON ATMOSPHERIC AEROSOLS, Texas Univ., Austin. For primary bibliographic entry see Field 05B. W72-12779

RECENT CALCULATIONS OF COLLISION EF-FICIENCIES, University Coll., London (England). Dept. of Mathematics. For primary bibliographic entry see Field 05B. W72-12780

PROCESSES INFLUENCING EVOLUTION OF DROPLET OR AEROSOL SPECTRUM, National Center for Atmospheric Research, Rational Center for Atmospheric Resea Boulder, Colo. For primary bibliographic entry see Field 05B. W72-12781

PHORETIC PROCESSES IN SCAVENGING, Battelle-Pacific Northwest Labs., Richland, For primary bibliographic entry see Field 05B. W72-12783

PRECIPITATION SCAVENGING IN A LARGE-CLOUD DIFFUSION CODE, California Univ., Livermore. Lawrence Radiation Lab.

For primary bibliographic entry see Field 05B. W72-12784

SCAVENGING OF AEROSOLS BY RAIN: A NU-MERICAL STUDY,
IBM Scientific Center, Palo Alto, Calif.
For primary bibliographic entry see Field 05B.

USE OF NATURAL RADIOACTIVITIES TO ESTIMATE LARGE-SCALE PRECIPITATION SCAVENGING, ESSA Research Labs., Silver Spring, Md. Air Resources Lab.

For primary bibliographic entry see Field 05B.

SCAVENGING PREDICTION USING RATIOS OF CONCENTRATIONS IN AIR AND OF CONCENTRATIONS IN AIR AND PRECIPITATION, Division of Biology and Medicine (AEC), Washington, D.C. For primary bibliographic entry see Field 05B. W72-12788

THROUGHFALL AND STEMFLOW RELATIONSHIPS IN SECOND-GROWTH PONDEROSA PINE IN THE BLACK HILLS, Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. H. K. Orr. USDA, Forest Service Research, Note RM-210. 1972, 7 p.

Descriptors: *Throughfall, *Stemflow, *Ponderosa pine trees, *Canopy, *Interception, Precipitation, Hydrology, Forecasting, *South

Identifiers: *Throughfall-canopy relationships, *D.b.h.-stemflow relationships, Net rainfall, Second-growth ponderosa pine forest, *Black

Results demonstrate use of canopy density to adjust throughfall, and diameter, breast high (d.b.h.) to adjust stemflow, though both are primarily dependent on gross rainfall. Combining the two relationships, an equation for estimation of net rainfall under Black Hills conditions is presented. (Orr-Forest Service)

AGROMETEOROLOGICAL INVESTIGATIONS OF HEAT BALANCE AND WATER BALANCE IN AGRICULTURAL FIELDS: II. COM-PONENTS OF THE WATER BALANCE, Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
For primary bibliographic entry see Field 03F. W72-12888

MEASUREMENT AND DISTRIBUTION OF RAINFALL IN PINE STANDS OF THE VAC-CINIUM VITIS-IDAEA AND V. MYRTILLUS TYPES, L. Raid.

Sb Nauchn Tr Est S-Kh Akad. 60. p 8-18. 1969. Identifiers: Distribution, Rain gages, Interception, *Measurement, Pine G, Rain, *Rainfall, Spruce G, Stands, USSR, Vaccinium myrtillus D, Vaccinium vitis idaea D.

In pure Vaccinium vitis-idaea type (VV) pine forests, 3-4 rain gauges are adequate, whereas in the VV and V. myrtillus type pine forests with spruce underwood 8-12 rain gauges are required. The amount of rainfall intercepted by tree crowns and its distribution in the stands depends on composition and density of the stand, structure of the crown, as well as on the amount and intensity of precipitation. In pure pine forests, crowns intercepted 24-28% of precipitation during the growth season, 33-34% in forests with spruce underwood, and up to 36.6% in 2-storied stands. The amount of rainfall varies within a comparatively wide range, depending on the place of measurement; in pure pine forests the difference between the amount of precipitation in the individual rain gauges was 18.5-26.4%, whereas with the presence of spruce underwood it was 34.9-35.9%.—Copyright 1972, Biological Abstracts, Inc. 2C. Snow, Ice, and Frost

SALINITY CALCULATIONS FROM IN SITU MEASUREMENTS,
Department of the Environment, Victoria (British
Columbia). Marine Sciences Branch (Pacific Region). For primary bibliographic entry see Field 02L. W72-12427

A SYNOPTIC SNOWSTORMS CLIMATOLOGY IN NORTHW NORTHWESTERN NEVADA, National Weather Service, Reno, Nev. Weather Service Office. B. L. Nelson, P. M. Fransioli, and C. M Sakamoto National Oceanic and Atmospheric Administra-tion Technical Memorandum NWS WR-73, February 1972. 23 p, 16 fig, 2 tab, 10 ref.

Descriptors: *Snowfall, *Climatology, *Classifi-cation, *Nevada, *Snow surveys, Meteorological Identifiers: *Snowstorms.

A climatological aid is presented for forecasting snow in northwestern Nevada. A total of 112 snowstorms affecting Reno, Lovelock, or Win-nemucca over a 10-year period were analyzed. Five separate categories were defined and are discussed. A separate discussion of the unusual discussed. A separate discussion of the unusual thunderstorm-snowstorm occurrence on May 20-21, 1971, is included. The storms were typed using mean storm tracks for the United States after Bowie and Weightman. The North Pacific Storm Track was interpreted to be the path of cyclones moving inland from northern California, Washington, and Oregon and was broken down into three ton, and Oregon and was broken down into three types: (1) a north Pacific cyclone tracking across Washington or Oregon with no wave development along the front; (2) a north Pacific cyclone tracking southeasterly across Nevada; and (3) a north Pacific cyclone with wave development along the frontal system. Cyclones that move inland from southern California (type 4) were categorized as a South Pacific Storm Track moving inland into California and tracking across southern Nevada. Snowfall that does not conform to one of the other. Snowfall that does not conform to one of the other four storm tracks was classified as type 5. Over 80% of the snowstorms were associated with the three types of North Pacific Storm Track. (Woodard-USGS) W72-12432

EVALUATION OF AVALANCHE HAZARDS IN THE VICINITY OF MZHAVETSKALI AND AVALANCHE CONTROL TECHNIQUES (OTSENKA LAVINNOY OPASNOSTI V RAYONE MZHAVETSKALI I ZASHCHITA OT LAVIN), Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.

INTERNATIONAL SYMPOSIUM ON WATER POLLUTION CONTROL IN COLD CLIMATES. Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 05C. W72-12548

BIOLOGICAL SEWAGE TREATMENT IN A COLD CLIMATE AREA, Hokkaido Univ., Sapporo (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05D.
W72-12564

MICROBIOLOGIC INDICATORS OF THE EF-FICIENCY OF AN AERATED, CONTINUOUS-

Group 2C-Snow, Ice, and Frost

-DISCHARGE, SEWAGE LAGOON IN NORTHERN CLIMATES, North Dakota Univ., Grand Forks. School of Medicine. For primary bibliographic entry see Field 05D.

DISINFECTION AND TEMPERATURE IN-

FLUENCES, Robert A. Taft Water Research Center, Cincin nati, Ohio. Advanced Waste Treatment Research Lab.

For primary bibliographic entry see Field 05D. W72-12566

DETERMINATION OF THE WATER EQUIVALENT OF SNOW COVER-METHODS

AND EQUIPMENT.
Gosudarstvennyi Gidrologicheskii Institut, Lenin-

Trans available from the National Technical Information Service as TT 70-50093, \$3.00 in paper copy, \$0.95 in microfiche. Israel Program for Scientific Translations, Jerusalem, L. K. Vershinina, and A. M. Dimaksyan, editors, 1971. 142 p. (TT 70-5093, Translated from Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 178, Leningrad, 1969).

Descriptors: *Snow surveys, *Snow cover, *Water equivalent, *Depth, *Aerial photography, Remote sensing, Radiation, Gamma rays, Meteorology, Topography, Water balance, Water table, Soil moisture, Ice, Watersheds (Basins), Physiographic provinces, Instrumentation, Equipment, Measurement, Analytical techniques.

Identifiers: *USSR, *Snow depth, *Snow density, *Snow courses, Water-balance method, Radiome-

This collection contains 11 papers dealing with aerial photographic snow-depth measurements, based on attenuation of the natural gamma radiation of the earth by snow cover. Data are given on snow surveys performed on the ground and on snow depths as observed from the air. Computed water equivalents of snow are compared with water equivalents reported by radiotelemetering snow gages. Snow-survey operations conducted in 1964-68 in different physiographic provinces of the USSR will provide data for locating snow courses and for designing new snow-survey systems. (Josefson-USGS)
W72-12697

ENTRY OF FREEZING NUCLEI INTO PRECIPITATION,
Wyoming Univ., Laramie. Natural Resources Research Inst. ary bibliographic entry see Field 05B. W72-12756

SCAVENGING BY SNOW AND ICE CRYSTALS, Illinois Inst. of Tech., Chicago. For primary bibliographic entry see Field 05B. W72-12760

SLAB AVALANCHING AND THE STATE OF STRESS IN FALLEN SNOW, Washington Univ., Seattle. C. B. Brown, R. J. Evans, and E. R. LaChapelle

Journal of Geophysical Research, Vol 77, No 24, p 4570-4580, August 20, 1972. 8 fig, 2 tab, 8 ref. *Shear strength,

Descriptors: *Avalanches, *Shear strength, *Shear stress, *Snowpacks, Snow, Mass wasting, Mechanical properties, Yield strength. Identifiers: *Shear failure (Slab avalanches), *Slab avalanches

The initial state of stress in fallen snow may be cal-The initial state of stress in taken show may be called by considering incremental gravity loading of the accreting snow slab. It is postulated that slab avalanche release is initiated by a reduction of slab avalanche release is initiated by a reduction of shear strength on a critical layer to a value below that of the existing shearing stress. The manner of top tensile failure, side shear failure, and either buckling or shear compression failure at the lower end of the slab is described. These results provide avalanche dimensions that are lower bounds on those occurring naturally. (Knapp-USGS) W72-12867

ICE THICKNESS OBSERVATIONS, NORTH AMERICAN ARCTIC AND SUBARCTIC, 1968--69, 1969-70, Cold Regions Research and Engineering Lab.,

Hanover, N.H. M. A. Bilello, and R. E. Bates.

Army Cold Regions Research and Engineering Laboratory Special Report 43, Part 6, June 1972. 97 p, 6 fig. 2 tab. 19 ref, 2 append. DA Task 4A061102B52E02.

Descriptors: *Ice cover, *Arctic, *North America, *Sea ice, *Iced lakes, Ice breakup, Rivers, Data collections, Investigations, Measurement, Alaska, Cold regions.
Identifiers: *Ice thickness. Ice formation.

This is the sixth in a series of reports on lake and river ice and land-fast sea-ice thicknesses observed throughout the North American arctic and subarctic during 1968-69 and 1969-70 seasons. Information on ice surface conditions, dates of first ice, freeze-over and breakup, and measurem of ice thickness made on the second voyage of the S. S. Manhattan are also included. Continued reports from the Alaska National Guard Network on note thickness measurements on lakes and rivers in the remote regions of interior Alaska are presented. Analyses are made of maximum observed ice thicknesses reported during the two winters in North America. (Woodard-USGS)

EFFECT OF FOREST AND FOREST BELTS ON THE SNOW COVER IN THE CENTRAL POLESIE IN THE UKRAINIAN SSR, F. S. Komarov, and P. V. Lytvak. Nauk Pr Zhytomyr Sil'S' Kohospod Inst. 16, p 77-

Identifiers: *Shelterbelts, Snow cover, Forests, Frozen ground, *Snow management, Soils, Ukrainian-SSR.

Investigations were carried out on forest and field plots protected by forest belts. In the middle-aged piots protected by forest beits. In the middle-aged stands snow was deposited evenly. A stable snow cover is preserved in the forest for about 90 days. In 1962-1965 the highest accumulation occurred in the forest belts. The snowdrift on the windward side was 1.5-4.2 times and on the leeward side 2.0-9.2 times the height of the trees. The actively protected zone of the forest belt was 20.1% of the entity in final the second was 1.5-4.2 times final the second was 1.5-4.2 times for the second was 20.1% of the entity in forest belts. tire field. The snow density in forest belts was 1.2 times and in the field 1.4 times higher than in the forest. Freezing of the soil in the field was several times greater than in the forest and forest belts. In the forest, snow persists 5/10 days longer, and in the forest belts 10-15 days longer than in the field.— Copyright 1972, Biological Abstracts, Inc. W72-12915

2D. Evaporation and Transpiration

WATER USE EFFICIENCY IN PLANT GROWTH AND AMBIENT CARBON DIOXIDE LEVEL, Texas A and M Univ., College Station. Water

Resources Inst.
For primary bibliographic entry see Field 03B.
W72-12391

PROBLEMS OF EVAPORATION ASSESSMENT IN THE WATER BALANCE, C. E. Hounam.

C. E. Hounam.
World Meteorological Organization Reports on
WMO/IHD Projects, Report No 13, 1971. 80 p, 2
fig, 4 tab, 95 ref.

Descriptors: *Water balance, *Evaporation, *Energy budget, Data collections, Heat balance, Lysimeters, Soil moisture, Rmote sensing, Inter-national Hydrological Decade.

In computing water balances, whether for large or small areas, a major factor in the equation is evaporation. The problem of obtaining an estimate of evaporation from an area is a very difficult one in most instances, and is often simplified by using representative point estimates in catchments and subcatchments. Various methods are given for measuring point evaporation, which can be used to obtain the data needed for an assessment of the total evaporation from an area. Particular attention is given to the factors affecting the spatial variais given to the factors affecting the spatial varia-tion in evaporation, and to the networks of instru-ments required. Accurate estimates of evaporation and aerial and satellite photography can be used in water balances for very large areas of the world. (Knapp-USGS) W72-12415

OCEANIC PART OF THE HYDROLOGICAL CYCLE, For primar W72-12416 ry bibliographic entry see Field 02A.

EVAPORATION LOSS NOW REPORTED DAI-LY, National Weather Service, Lubbock, Tex. For primary bibliographic entry see Field 03F. W72-12515

WATER USE STUDIES ON FORAGE GRASSES

WATER USE STUDIES ON FORAGE GRASSES IN NORTHERN NEVADA, Nevada Agricultural Experiment Station, Reno; and Agricultural Research Service, Reno, Nev. Soil and Water Conservation Research Div. A. S. Dylla, D. M. Stuart, and D. W. Michener. Nevada University Agricultural Experiment Station T10. 56 p, May 1972. 26 fig, 23 tab, 10 ref.

Descriptors: *Evapotranspiration, *Efficiencies, *Arid lands, *Grasses, Evaporation pans, Estimating equations, Solar radiation, Forage grasses, Plant groupings, Climatic data, Micrometeorology, Irrigation practices, Root zone, Saline soils, Nevada. Identifiers: *Water use efficiencies.

This report covers 3 years of water use studies on 3 native meadow grass species (saltgrass, sedges and bluejoint) growing in evapotranspiration (ET) and bluejoint) growing in evapotranspiration (ET) tanks at Winnemucca, Nevada. Additionally, 2 years of study were devoted to 2 native forage grasses (tall wheatgrass and alta fescue). The sedges and saltgrass were grown under seasonal high water table treatments only, while the other species were also given surface irrigation treatments. Ratios of measured ET in the tanks to measured. sured pan evaporation, measured net radiation and calculated ET from meteorological data by the methods of Van Bavel, Blaney-Criddle and Olivier methods of Van Bavel, Blaney-Criddle and Olivier were graphed against growing season month for I week and 4-week periods. The highest correlation with measured ET was obtained with the Van Pavel combination model, but the Olivier model is the simplest in use when pan evaporation data are available. The sedges used the most water of the wet meadow group, followed by bluejoint and salt-grass. Under irrigation, tall wheat grass used more than alta fescue but bluejoint used the most. Surface irrigations produced the highest water use efficiencies because they kept soil root zone salinity levels below 4 mmhos/cm (saturated extract conductivity). Saltgrass, sedges and bluejoint showed ductivity). Saltgrass, sedges and bluejoint showed the highest water use efficiencies under high soil

Streamflow and Runoff—Group 2E

salinity levels. The highest water use efficiency at-tained was 171 lb hay/acre-inch by bluejoint and sedges. (Casey-Arizona) W72-12522

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EVALUATION OF TRANSPIRATION SUPPRES-SANTS AS AN ALTERNATIVE TO THE ERADI-CATION OF SALTCEDAR THICKETS, Arizona Univ., Tucson. Dept. of Watershed Management. For primary bibliographic entry see Field 03B. W72-12523

PHENOMENON OF WATER VAPOR ABSORP-TION FROM INTERCELLULAR SPACE OF LEAVES, L. N. Babushkin.

Izv Akad Nauk SSSR Ser Biol. 3. p 389-397. 1970. Illus. English summary.
Identifiers: *Absorption, *Water vapor, Carbon dioxide, Concentration, Intensity, Leaves, Space.

Water vapor absorption occurs simultaneously with leaf transpiration. Water absorption depends on the CO2 content in the intercellular spaces. Maximum absorption intensity is observed under optimal CO2 content. The deviation of the CO2 from the optimum to both sides leads to a decrease in vapor absorption intensity. The average value of the vapor absorption comprises 20-40% of the total amount of vapor which is formed in the intercellular space. The water vapor absorption from the inantoun of vapor which is formed in the intercellular space. The water vapor absorption from the intercellular space is a biological process, and carries out important physiological functions.—Copyright 1972, Biological Abstracts, Inc.

W72-12684

CONVECTIVE SALT ACCUMULATION IN THE CONVECTIVE SALT ACCUMULATION IN THE
CAPILLARY FRINGE PRODUCED BY SOILWATER EVAPORATION (KONVEKTIVNOYE
SOLENAKOPLENIYE V KAPILLYARNOY
KAYME, VYZVANNOYE ISPARENIYEM
POCHVENNYKH VOD),
Institut Gidrodinamiki, Novosibirsk (USSR).
V. I. Pen'kovskiy.
Pochvovedeniye, No 11, p 137-140, November
1971. 3 fig. 2 ref.

Descriptors: *Salts, *Soil water, *Capillary action, *Capillary fringe, *Evaporation, Saturation, Moisture content, Water table, Groundwater, Porous media, Porosity, Mathematical studies, Mathematical models, Equations.

Identifiers: *USSR, Capillary rise.

The use of a mathematical model to study accumulation of salts where there is evaporation in the capillary fringe between the water table and the maximum height of capillary rise is discussed. Equations are developed to determine critical groundwater depth, total evaporation from the zone of aeration, and moisture distribution in the capillary frings. Stratification of various trues of cone or acrauon, and mossture distribution in the capillary fringe. Stratification of various types of salts in the capillary fringe is investigated and graphed on the basis of mathematical techniques. (Josefson-USGS)
W72-12691

THROUGHFALL AND STEMFLOW RELA-TIONSHIPS IN SECOND-GROWTH PON-DEROSA PINE IN THE BLACK HILLS, Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 02B. W72-12813

A TEST OF THE POTENTIAL ACCURACY OF THE WATER-BUDGET APPROACH TO ESTI-MATING EVAPOTRANSPIRATION, McGill Univ., Montreal (Quebec). Dept. of Geog-raphy; and McMaster Univ., Hamilton (Ontario). Dept. of Geography. W. R. Rouse, and R. G. Wilson. Agricultural Meteorology, Vol 9, No 5/6, p 421-446, March 1972. 16 fig, 6 tab, 14 ref.

Descriptors: "Micrometeorology, "Evapotrans-piration, "Estimating equations, "Water balance, "Energy budget, On-site data collections, Solar radiation, Soil temperature, Soil environment, Hydraulic gradient, Soil moisture. Identifiers: "Net radiation, "Bowen ratio, "Poten-tial evapotranspiration, "Matric potential.

Although the water-budget approach to determining evapotranspiration has the advantage of simple, easy measurement, its reliability has been questioned. This study focuses particularly on the reliability of measured soil moisture change. Latent heat of evaporation (LE) is the point of intersection between energy-budget and water-budget, so one approach may be used in testing the accuracy of the other. Using neutron attenuation and gravimetric techniques, soil moisture changes were measured for 1- and 4-day periods in a corn field. Hydraulic head gradients and soil moisture characteristics and capillary conductivities were also obtained. Measurements of net radiation, soil heat flow and Bowen ratios allowed for energyalso obtained. Measurements of net radiation, soil heat flow and Bowen ratios allowed for energy-budget calculations. Both a water budget error analysis and the experimental results lead to the conclusion that the water-budget cannot accurately estimate evapotranspiration on a daily basis due to many potentially large errors. The conditions necessary for accurate determinations are described and discussed. (Casey-Arizona) W772.1932.

A CRITICAL STUDY OF EVAPORATION BY PENMAN'S METHOD DURING THE GROWING SEASON OF VEGETATION IN THE ARID ZONE OF INDIA, Jodhpur Univ. (India). Dept. of Mathematics.

A. Krishnan, and R. S. Kushwaha.

Archiv fur Meteorologie, Geophysik and Bioklimatologie, Series B: Climatology, Bioclimatologies, Radiation Research, Vol 19, No 3, p 267-276, 1971. 2 fig, 3 tab, 14 ref.

Descriptors: *Evapotranspiration, *Arid lands, *Estimating equations, *Evaporation pans, *Onsite data collections, Correlation analysis, Regression analysis, Agroclimatology, Energy budget,

Identifiers: *Potential evapotranspiration, *India.

Jodhpur is in an arid region of low and highly vari-able rainfall and high evaporation. The storage and planned use of monsoon-fed reservoirs would planned use of monsoon-fed reservoirs would benefit from accurate evaporation estimations. The potential evaporation calculated from Penman's equation was compared with measurements from a U.S.A. open pan evaporimeter obtained during the growing season of 1963 and 1964. Using 5-day mean values, the data indicated that Penman's method very much underestimated evaporation values. Using correlation coefficients, it was shown that under the arid zone conditions of Jodhpur, the aerodynamic term of Penman's equation was much more significant in determining evaporation than the energy balance term. The 1 and 4 weightages of the aerodynamic and energy balance terms of the original equation were revised to 0.61 and 1.13 as per observed values. (Casey-Anizona) (Casey-Arizona) W72-12843

DROUGHT IN ARIZONA: A DROUGHT IDENTIFICATION METHODOLOGY AND Arizona Univ., Tucson. Dept. of Economic and Business Research.

1972. 65 P, 34 FIG, 13 TAB, 68 REF.

Descriptors: *Droughts, *Evapotranspiration, *Hydrologic budget, *Arizona, *Moisture stress, Rainfall, Model studies, Probability, Seasonal, Analytical techniques.

Identifiers: Potential Precipitation deficit. evapotranspiration.

Drought must be recognized as a frequently occurring phenomenon within Arizona. Its patterns of occurrence are complex, varying significantly in intensity, frequency, and duration from year to year. Analysis of Arizona drought records indicates that drought is not limited in either time or space, that at any given time drought status is dependent on prior moisture status, and that areas of most intense aridity are less likely to experience major negative moisture status departures. Patterns of expected monthly drought occurrence are established. The Shear-Steila Drought Index, tuilizing the Thornthwaite technique as a base, appears consistently to reflect environmental changes, paralleling actual environmental changes, paralleling actual environmental moisture status. Further application of the model should aid in clarifying plant-moisture status relationships, identify threshold drought index values of significance in fire-hazard forecasting, and add to the understanding of the interrelationships that constitute area character. (Paylore-Arizona)

SAMPLING TO ESTIMATE MEAN LEAF TEM-PERATURES AND TRANSPIRATION RATES IN VEGETATION CANOPIES, San Diego State Coll., Calif. P. C. Miller. Ecology. Vol 52, No 5: p 885-889. 1971. Illus. Identifiers: Balance, Energy budget, Canopies, Energy, Equations, *Leaves, Orientation, Rates, *Sampling, Sun, Temperatures, *Transpiration, Vegetation.

The measurement of leaf temperatures at different levels in the canopy is important for clarifying the relative contributions of each level to the energy balance, evapotranspiration, and primary production of the total canopy. Frequency mean leaf temperatures at each level will be adequate for the study. Since individual leaf temperatures vary at each level, more than one leaf temperature must be measured to estimate mean leaf temperature. A procedure is outlined for deciding the number of leaves at each level required to estimate the mean procedure is outlined for deciding the number of leaves at each level required to estimate the mean leaf temperature within specified accuracies. The procedure involves first calculating expected in sunlit leaf temperatures due to differing orientation to the sun and leaf resistance, sunlit leaf temperatures with the energy-budget equation, then estimating the variation to be solved for the number of sunlit leaves to be measured, and finally, calculating the total number of leaves to be measured at each level in order to have an adequate sample of both sunlit and shaded leaves. The number of leaves calculated by this procedure should be considered the minimum number of leaves to be measured because of other causes of variation in leaf temperatures.—Copyright 1972, Biological Abstracts, Inc.

2E. Streamflow and Runoff

PROGRAM FOR ESTIMATING RUNOFF A PROGRAM FOR ESTIMATING RUNOFF FROM INDIANA WATERSHEDS PART IL AS-SEMBLY OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA, Purdue Univ., Lafayette, Ind. Water Resources Research Center. For primary bibliographic entry see Field 02A. W72-12392

STREAMFLOW CHARACTERISTICS OF THE POTOMAC RIVER,
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
For primary bibliographic entry see Field 04A.
W72-12401

Group 2E-Streamflow and Runoff

SEDIMENT TRANSPORT AND DEPOSITION, WALNUT AND PACHECO CREEKS, CONTRA COSTA COUNTY, CALIFORNIA, AUGUST 1965-APRIL 1970, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02J. W72-12409

SURFACE WATER IN DUVAL AND NASSAU COUNTIES, FLORIDA, Geological Survey, Tallahassee, Fla. W. Anderson. Geological Survey Open-file Report 72007, 1972. 65 p, 19 fig, 1 tab, 11 ref.

Descriptors: *Surface water availability, *Water resources, *Florida, *Streamflow, Rainfall, Runoff, Evapotranspiration, Floods, Estuaries, Tideffects, Temperature, Humidity, Winds, Hydrologic data, Basic data collections, Discharge pressurement, Flow, and Plant Streams (Flow, 2018). measurement, Flow rates. Identifiers: Duval County (Fla), *Nassau County

(Fla).

The potential surface-water supplies from streams in Duval and Nassau Counties, Florida are enormous. Average unit runoff from the two counties is about 50% greater than that from the State as a whole. Runoff from about 12,000 square miles is available, yet surface water is little used except for cooling purposes and recreation. The chief reason for not using surface water is the availability of more than sufficient supplies of groundwater, chiefly from the Floridan aquifer. Other reasons discharges remaining very low or zero for long periods and contamination of supplies by pollutants or sea water. The source of surface water in the area is rainfall and water from the St. Johns and St. Marys rivers. Rainfall averages 51.5 inches of which about 60% returns to the atmosphere by evapotranspiration. Little of the rain seeps evapotranspiration. Little of the rain seeps downward to the Floridan aquifer except in Yellow Water Creek basin. Four areas exist in which the peak rates of flow caused by specific rainfalls are distinctly different. Floods in the tide-affected areas are important in that storm tides can cause inundation of large areas not otherwise subject to flooding. (Woodard-USGS) W72-12419

KANSAS STREAMFLOW CHARACTERISTICS. PART 9, MEAN ANNUAL RUNOFF AS RE-LATED TO CHANNEL GEOMETRY OF SELECTED STREAMS IN KANSAS, Kansas State Geological Survey, Lawrence. E. R. Hedman, and W. M. Kastner. Kansas Water Resources Board Technical Report No 9, January 1972. 25 p, 9 fig, 2 tab, 12 ref.

Descriptors: *Streamflow, *Runoff, *Channel morphology, *Kansas, Hydrologic data, Data collections, Ephemeral streams, Perennial streams, Curves, Regression analysis, Equations, Rating curves, Correlation analysis.

Identifiers: Run-off-channel geometry relation-

Measurements of the channel geometry of gaged streams in Kansas where mean annual flow is known were analyzed by multiple regression. The es provided equations relating mean annual analyses provided equations relating mean annual runoff to channel geometry for perennial and ephemeral streams, and mean annual runoff to channel geometry, basin area, and precipitation for perennial streams. Equations for perennial streams were developed from the records of 45 gaging stations in Kansas. Equations for ephemeral streams were developed from the records of five gaging stations in Kansas and 13 in North and South Dakota. The equations can be used to estimate the mean annual runoff at ungaged sites. For perennial streams the standard error from a curvilinear equation using dimensions of channel geometry alone was 35%; the standard error from a linear equation using the dimensions

of channel geometry, basin drainage area, and precipitation was 20%. For ephemeral streams the standard error from a curvilinear equation and also a linear equation using dimensions of channel geometry alone was 42%. (Woodard-USGS) W72-12423

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1970, Geological Survey, Austin, Tex.

D. E. Ferguson.
Geological Survey Open-file Report (Texas District), March 1972. 275 p, 16 fig, 14 tab, 1 ref.

Descriptors: *Hydrologic data, *Basic data collections, *Urban hydrology, *Rainfall-runoff relationships, *Texas, Floods, Streamflow, Stream gages, Discharge measurement, Flow rates, Rain gages, Peak discharge, Storms. Identifiers: *Houston (Tex).

Basic hydrologic data were collected in the Houston urban area for the 1970 water year (Ocroused urban area for me 1970 water year cotober 1969 to September 1970) primarily to determine the effect of urban development on flood peaks and volume. Rainfall for the year was unevenly distributed. Individual station totals ranged from 32.2 inches at the Houston City rain gage to 58.1 inches at the Houston Alief rain gage. The comparison of accumulated monthly rainfall is shown for the 1970 water year over four widely separated drainage basins with the 30-year average (1931-60) at the Houston FAA Airport rain gage Emphasis is given to the storms of May 1, 15-16, 21, and 30-31 when moderately heavy amounts of rain fell. Because the rains were frequent and had low intensities and long durations, they were the most significant storms of the current year. The largest amount of rainfall for an individual storm was 6.3 inches. This rainfall occurred on May 15 at the station Greens Bayou at U.S. Highway 75. (Woodard-USGS)
W72-12430

HYDROLOGY OF MOUNTAIN RIVERS (VOPROSY GIDROLOGII GORNYKH REK), Zakavkazskii Sidrometeorologicheskii Insuitut, Tilis (USSR).

Zakavkazskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), G. N. Khmaladze, editor, 1970. 180 p.

Descriptors: *Hydrology, *Orography, *Rivers, River basins, Watersheds (Basins), Lakes, Forests, Avalanches, Mudflows, Sediments, Meteorology, Rainfall-runoff relationships, Flow, Groundwater, Water balance, Water properties, Heat, Annual, Seasonal, Forecasting, Identifiers: *USSR, *Caucasus, *Caspian Sea, *Mountain hydrology, Lowlands, Snow avalanches, Phytoreclamation.

This collection contains 15 papers dealing with various aspects of mountain hydrology, including areal distribution and variability of average annual precipitation; calculation of mountain streamflow in an erodible channel; hydraulics of mudflows and avalanches; and effects of forest cover on water regime of mountain rivers. Other topics inwater regime of mountain rivers. Other topics in-clude: (1) effects of viscous and turbulent flow on channel conveyance; (2) sediment transport caused by wave movement; (3) relation between bottom-sediment and suspended-sediment discharges; (4) use of 'tagged' sands to study sedi-ment transport; (5) forecasting of annual water inflow to Lake Sevan; (6) storage and flow of groundwater in lava formations; (7) evaluation of avalanche hazards and avalanche control techniques; (8) statistical analysis of extremely large wind waves of rare occurrence; and (9) thermal regime of waters near the east coast of the Caspian Sea. (See W72-12435 thru W72-12441) (Josefson-USGS)

W72-12434

SEDIMENT TRANSPORT CAUSED BY WAVE MOVEMENT (TRANSPORT NANOSOV VOL-NAMI),

Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR). V. I. Vinogradova, Ye. I. Mass, and N. I. Salukvadze.

In: Voprosy gidrologii gornykh rek; Zakavkazskiy Nauchno-Isaledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), p 17-28, 1970. 4 fig. 4 ub, 13 ref.

Descriptors: *Sediments, *Sediment transport, *Movement, *Waves (Water), Currents (Water), Sands, Flumes, Roughness (Hydraulic), Channel flow, Velocity, Equations, Foreign research. Identifiers: USSR, Riffles, *Georgian SSR.

Determination of sediment transport due to wave movement was based on a series of experiments in large and small flumes designed by the Georgian Scientific Research Institute of Hydraulic Engineering and Reclamation. Wave height in the large 50-m x 72-cm flume ranged from 0.095 m to 0.20 m, and wave height in the small 12-m x 31-cm flume ranged from 0.08 m to 0.12 m. The slope of the wave in the large flume was 0.06-0.02 and that in the small flume was 0.07-0.34. Roughness was obtained from riffles placed at the bottom of the flume. Results presented in tabular form include same discharges and maximum bottom velocities at varying depths and discharges in the flume. Rela-tionships for determining transport of sediment by longshore currents and by flow in channels are reviewed. (See also W72-12434) (Josefson-USGS) W72-12435 sand discharges and maximum bottom velocities at

RELATION BETWEEN BOTTOM-SEDIMENT AND SUSPENDED-SEDIMENT DISCHARGES (NEKOTORYYE SOOBRAZHENIYA O SOOT-NOSHENII MEZHDU RASKHODAMI VLEKO-MYKH I VZVESHENNYKH NANOSOV), Zakavkazskii Nauchno-Issledovatelskii

Gidrometeorologicheskii Institut, Tiflis (USSR). G. N. Khmaladze

In: Voprosy gidrologii gornykh rek; Zakavkazskiy Nauchno-Issledovateľskiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), p 76-84, 1970. 3 fig, 1 tab, 7 ref.

*Sedimentation, *Sediment Descriptors: discharge, *Bottom sediments, *Suspended load, Suspension, Discharge (Water), Rivers, River basins, Watersheds (Basins), Drainage area, Slopes, Variability. Identifiers: USSR, *Caucasus, *Georgian SSR, *Terek River, *Suspended sediments.

To determine the ratio of bottom-sediment discharges (G) to suspended-sediment discharges (R), investigations were carried out in 1940 on the Terek River near Kazbegi in the Georgian SSR The lowest G/R ratio was observed on July 14 when water discharge was 91.8 cu m/sec and suspended-sediment discharge was 1,570 kg/sec. The highest G/R ratio was observed on May 25 The highest G/R ratio was observed on May 25 when water discharge was 51.0 cu m/sec and discharge of suspended sediments was 39.2 kg/sec. The G/R ratio varies widely for Caucasian rivers, ranging from 0.13 for the Kura River to 86.4 for the Zhovekvara River. Large rivers generally have low G/R ratios and small rivers have high G/R ratios, reaching 100%. Variations in G/R values these three thr along the channel depend on hydraulic cond river-basin characteristics, and volume of flow in rivers. (See also W72-12434) (Josefson-USGS) W72-12436

DISTRIBUTION AND VARIABILITY OF ANNUAL PRECIPITATION ON THE KOLKHIDA (RASPREDELENIYE

Streamflow and Runoff-Group 2E

MENCHIVOST' GODOVYKH OSADKOV NA TERRITORII KOLKHIDSKOY NIZMENNOSTI), Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR). M. A. Mirianashvili. In: Voprosy gidrologii gornykh rek; Zakavkazskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), p 90-100, 1970. 4 fig, 2 tab, 9 ref.

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Descriptors: "Precipitation (Atmospheric), "Distribution, "Variability, "Annual, Seasonal, Average, Winds, Wetting, Evaporation, Meteorology, Orography, Maps, Measurement, Precipitation gages.

Identifiers: USSR, "Georgian SSR, "Kolkhida lowland, "Lowlands, Tretyakov precipitation gages, Isohyetal lines.

Investigations of the formation, areal distribution, and variability of average annual and seasonal precipitation on the Kolkhida lowland in the Georgian SSR were based on data of 23 meteorological stations for the period 1936-68. Total precipitation in a year ranges from 1,600 mm in the eastern part of the lowland to 2,800 mm along the southern shore. Precipitation during the warm season is 50%-65% of the annual precipitation or 1,000-1,200 mm. Precipitation during the cold season varies between 700 mm and 1,300 mm, the average being 900-950 mm. Variations in precipitation amounts are small (0.14-0.30) and are indicative of a more or less even distribution of rainfall over the lowland. Correction factors for wind and wetting applied to total annual precipitation and precipitation during warm and cold seasons are tabulated for 19 stations in the area. (See also W72-12434) (Josefson-USG3) USGS) W72-12437

EFFECTS OF FOREST COVER ON WATER REGIME OF SOME MOUNTAIN RIVERS IN THE SOUTH GEORGIAN UPLANDS (O VLIYANII LESA NA REZHIM NEKOTORYKH GORNYKH REK YUZHNO-GRUZINSKOG NAGOR'YA), Zakavkazskii Nauchno-Issledovatelskiy.

NAGOR'YA),
Zakavkazskii Nauchno-Issledovatelskiy.
Gidrometeorologicheskiy Institut, Tiflis (USSR).
L. V. Glinskaya.
In: Voprosy gidrologii gornykh rek; Zakavkazskiy
Nauchno-Issledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 37
(43), p 112-123, 1970. 6 fig, 4 tab, 15 ref.

Descriptors: *Orography, *Mountain forests, *Trees, *Rivers, River basins, Watersheds (Basins), Rocks, Soils, Slopes, Streamflow, Runoff, Surface runoff, Base flow, Groundwater, Snowmelt, Floods, Annual, Seasonal. Identifiers: USSR, *Georgian SSR.

Effects of forest cover on water regime of rivers in the vicinity of the Trialetskiy ridge in the Georgian SSR were investigated for water-regulating properties of mountain forests. Average annual runoff from forested parts of the basin is more than from unforested parts. The contribution of groundwater to streamflow is greater for forested parts of the basin than for unforested parts. Effects of forest cover are not reflected in redistribution of runoff in time. However, the duration of spring floods in forested areas is longer and lasts 103-111 days as compared with 91-99 days in relatively unforested areas. (See also W72-12434) (Josefson-USGS) W72-12438

A METHOD FOR FORECASTING ANNUAL IN-FLOW OF WATER TO LAKE SEVAN (METOD PROGNOZA GODOVOGO PRITOKA VOD V OZERO SEVAN), Zakaykazkii

OZERO SEVAN),
Zakavkazskii Nauchno-Issledovatelskii
Gidrometeorologicheskii Institut, Tiflis (USSR).
O. A. Azernikova.
In: Voprosy gidrologii gornykh rek; Zakavkazskiy
Nauchno-Issledovatel'skiy

Gidrometeorologicheskiy Institut Trudy, No 37 (43), p 134-140, 1970. 2 fig. 2 tab. 5 ref.

Descriptors: *Methodology, *Forecasting, *Inflow, *Lakes, Lake basins, Rivers, Surface waters, Discharge (Water), Runoff, Antecedent precipitation, Rainfall-runoff relationships, Equations, Probability.
Identifiers: USSR, *Armenian SSR, *Lake Sevan.

A method is proposed for developing an 8-month and 12-month forecast of inflow of surface waters to Lake Sevan in the Armenian SSR, based on a 12-month and 16-month antecedent precipitation index. Accuracy of the forecast is within 2.64 cu m/sec. Depending on the equations used, the forecast probability is 93%-97%. (See also W72-12434) (Josefson-USGS)

EVALUATION OF AVALANCHE HAZARDS IN THE VICINITY OF MZHAVETSKALI AND AVALANCHE CONTROL TECHNIQUES (OTSENKA LAVINNOY OPASNOSTI V RAYONE MZHAVETSKALI I ZASHCHITA OT LAVIN), Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR). V Sh. Tsomava

Oldrometeorologicheski institut, i ins (USSK). V. Sh. Tsomaya. In: Voprosy gidrologii gornykh rek; Zakavkazskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 37 (43), p 146-154, 1970. 1 fig, 5 tab, 10 ref.

Descriptors: "Avalanches, "Snow cover, "Snow-fall, Water equivalent, Precipitation (Atmospher-ic), Meteorology, Geomorphology, Reforestation, Forest management, Snow management, Equa-tions, Evaluation.

uons, Evaluation. Identifiers: USSR, *Georgian SSR, *Snow avalanches, *Avalanche hazards, Avalanche chutes, Avalanche velocities, Avalanche release, Phytoreclamation.

Avalanche hazards in the vicinity of Mzhavetskali in the Georgian SSR were investigated in the summer of 1968 in connection with proposed construction of the Rachinskiy mining-metallurgical combine at the lower end of the Dzhvaruke ravine. Snowfalls with water equivalent in excess of 100 Snowfalls with water equivalent in excess of 100 mm are rare in the area. Extreme snowfalls were recorded between February 2 and February 14, 1932, and between January 28 and February 10, 1956, when total water equivalent was 180 mm and 190 mm, respectively. According to local residents, the only known snow avalanche in the area between 1928 and 1968 occurred on February 14, 1932 when snow cover increased by 365 cm to area between 1928 and 1968 occurred on February 14, 1932, when snow cover increased by 265 cm to produce a record depth of 315 cm. Avalanche defense and control measures discussed include: (1) reforestation of slopes at the site of avalanches; (2) establishment of dense forest plantations in the zone of avalanche release; and (3) construction of control structures for terrain modification. (See also W72-12434) (Josefson-IISGS) USGS) W72-12440

THERMAL REGIME OF WATERS NEAR THE
EAST COAST OF THE CASPIAN SEA
(OSOBENNOSTI TERMIKI VOD U
VOSTOCHNOGO POBEREZH'YA
KASPIYSKOGO MORYA),
Zakavkazskii Nauchno-Issledovatelskii
Gidrometeorologicheskii Institut, Tiflis (USSR).
V. M. Zhirnov.
In: Voprosy gidrologii gornykh rek; Zakavkazskiy
Nauchno-Issledovatel'skiy
Gidrometeorologicheskiy Institut Trudy, No 37
(43), p 162-172, 1970. 4 fig, 5 tab.

Descriptors: *Water properties, *Water tempera-ture, *Air temperature, Heat balance, Heat budget, Radiation, Winds, Meteorology, Orog-raphy, Shores, Coasts, Littoral, Shallow water, Depth, Seasonal, Variability.

Identifiers: USSR, *Caspian Sea, *Turkmen SSR, Heat exchange, Isopleths.

Investigations of the thermal regime of waters of the southeast Caspian near the period 1936-66 and on field data collected in 1967-68 by the Transcaucasian Scientific Research Hydrometeorological Institute and the Azaerbaydzhan Administration of the Hydrometeorological Service. The hydrologic regime of waters off the coast of the Turkmen SSR is determined by atmospheric processes over the Caspian Sea, amount of incoming solar radiation, orographic characteristics of coastal and surrounding areas, and by the proximity of desert regions in Soviet Central Asia. Annual water temperature increases in a southerly ty of desert regions in Soviet Central Asia. Annual water temperature increases in a southerly direction from 11.3 deg C at Bekdaah to 17.5 deg C at Gasan-Kuli. Annual water temperature in the Bekdash-Kuuli Mayak region varies between 3.3 deg C and 23.8 deg C and that in the Cheleken-Gasan-Kuli region between 4.7 deg C and 28.2 deg C. Average annual temperature of water near the coast varies between 12.4 deg C and 16.0 deg C, which is 2.6 deg C higher than the average annual air temperature. The water temperature increases on an average of 1.5 deg C for each degree of latitude. (See also W72-12434) (Josefson-USGS) W72-12441

WATER RESOURCES INVESTIGATIONS IN PUERTO RICO, AND VIRGIN ISLANDS, 1969. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12444

WATER RESOURCES INVESTIGATIONS IN MICHIGAN, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12445

WATER RESOURCES INVESTIGATIONS IN NEW YORK, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12446

WATER RESOURCES INVESTIGATIONS IN UTAH, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-12447.

WATER RESOURCES INVESTIGATIONS IN VIRGINIA, 1969. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12448

STUDIES IN DENSITY STRATIFIED FLOWS, New South Wales Univ., Kensington (Australia). School of Civil Engineering. For primary bibliographic entry see Field 08B. W72-12449

MULTIDIRECTIONAL TURBULENCE PROBE DEVELOPMENT PHASE I - UNIDIRECTIONAL TURBULENCE SENSOR DEVELOPMENT. Battelle Columbus Labs., Ohio.

Copy available from GPO Sup Doc EPA 16050 DOW 10/71, \$0.65; microfiche from NTIS as PB-211 280, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, October 1971. 61 p, 17 fig. EPA Program 16050 DOW 10/71.

Descriptors: *Turbulence, *Turbulent flow, *Streamflow, *Instrumentation, Non-uniform flow, Eddies, Channel flow, Flow profiles, Moni-toring, Data collections, Strain gages, Measure-

Group 2E-Streamflow and Runoff

Identifiers: *Turbulence sensors.

Development of a unidirectional-turbulence probe was undertaken to investigate the feasibility of a small-diameter strain-gaged diaphragm-type pres-sure transducer and a self-adjusting depth compensation air reservoir for use in the follow-on development of a small (1/2-inch diameter) multidirectional-turbulence probe. A unidirectional probe has been developed which is capable of monitoring water velocities over a range of 0.5 to 5 ft/sec in turbulence frequencies of 0 to over 100 Hertz and which will automatically operate in water up to 10-feet deep. Sealing inadequacies in water up to forest users, seaming materialistics to both the air reservoir membrane and the pressure diaphragm permit moisture entry into the air volume covering the strain gages. This has given rise to balance drift and circuitry ground problems that have resulted in the placing of limitations on the water exposure and turbulence monitoring times for the unidirectional probe. These problems also suggested that the concepts cannot be immediately incorporated into a multidirectional probe design. (Eagle-Vanderbilt) W72-12453

WATER RESOURCES INVESTIGATIONS IN

WYOMING, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12698

FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA-A COMPILATION OF PEAK DATA, OCTOBER 1958 TO SEPTEMBER 1971, Geological Survey, Menlo Park, Calif. A. O. Waananen.

Geological Survey Data Report, April 11, 1972. 140 p, 33 fig, 1 tab.

Descriptors: *Floods, *Small watersheds, *Streamflow, *Peak discharge, *California, Hydrologic data, Basic data collections, Gaging stations, Flow rates, Rainfall, Watershed management, Planning, Water resources development.

The magnitude and frequency of floods from drainage areas generally of less than 10 square miles was begun in California July 1, 1958. This is the 13th progress report (1971 water year) in an annual series designed to inform the cooperators and other interested parties of the status of the program. The reports consist mainly of a tabulation of the annual peak stage and discharge, by water years, for each gaging station in the program. The water year is the 12-month period ending September 30 of the specified year. The discharge hydrograph and recorded graph of accumulated rainfall for significant peak discharges during the current year are included for stations that are equipped with water-stage recorders. Monthly and annual rainfall totals are given for the recording stations. Program activities during the current year and program plans for the following year are sum-marized. The 1971 water year had moderate floods in small basins in south-coastal California in November and December 1970 and in northern and north-coastal regions of southern California in August 1971. (Woodard-USGS) W72-12703

CASE STUDY OF DURATION-LIMITED WAVE SPECTRA OBSERVED AT AN OPEN OCEAN

Naval Oceanographic Office, Washington, D.C. Naval oceanographic Office, washington, 5-6. P. S. DeLeonibus, and L. S. Simpson. Journal of Geophysical Research, Vol 77, No 24, p 4555-4569, August 20, 1972. 15 fig, 30 ref.

Descriptors: *Waves (Water), *Frequency analysis, *Fourier analysis, *Air-water interfaces, Ocean waves, Gravity waves, Statistics, Correlation analysis, Winds.
Identifiers: *Wind-sea interactions.

A sequence of double-peaked open-ocean wave spectra was observed and simultaneous eddy correlation estimates were made of momentum flux and atmospheric stability over a 15-hour interval at Argus Island tower (near Bermuda) on March 22 and 23, 1967. The wave spectra were associated with a generating sea and advecting swell in the fetch of the warm sector of an advancing cyclone. fetch of the warm sector of an advancing cyclone. The equilibrium range constant for these wave spectra was estimated to be 0.0078. The Miles-Phillips exponential growth parameter was in reasonably good agreement with other field investigations and observations support predicted amplification factors over the range C/U 20 to 32 where C is wave phase speed and U is the friction velocity. Two observations of both linear and exponential growth presented as equilibrium. ponential growth parameters associated with spectral frequencies of 0.13 and 0.14 Hz were available to compare predicted and observed wave growth, with good results after correction for residual wave background. Observed temporal overshootundershoot of a particular wave component is in-terpreted in terms of an energy balance between wind input, wave-wave interactions, and wave breaking as a wave component evolves to its equilibrium condition. Peaks in the horizontal and vertical wind-velocity spectra and the cospectra and quadrature spectra associated with spectral peaks are clearly evident when ocean swell propagates through the observation area. (Knapp-USGS) W72-12866

STREAMFLOW VARIATION AND DISTRIBU-TION IN THE BIG CYPRESS WATERSHED DURING WET AND DRY PERIODS, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 07C. W72-12869

EXPERIMENTAL STUDIES OF THE REFRAC-TION OF UNIFORM WAYE TRAINS AND TRANSIENT WAVE GROUPS NEAR A STRAIGHT CAUSTIC, New York Univ., Bronx. Dept. of Meteorology

and Oceanography.
Y. Y. Chao, and W. J. Pierson.
Journal of Geophysical Research, Vol 77, No 24, p 4545-4554, August 20, 1972. 6 fig, 16 ref.

Descriptors: *Waves (Water), *Hydraulic models, *Gravity waves, *Refraction (Water waves), Frequency analysis, Fourier analysis, Identifiers: *Caustics (Water waves).

An experimental study of gravity wave behavior near a straight caustic was carried out in a wave tank that was 4.26 meters square and 30.48 centimeters deep. A uniform wave train was generated in shallow water of constant depth and propagated toward a portion of the tank where the depth increased linearly to a value equivalent to deep water. The straight line at which the depth started to increase was 50 deg to the wave crests at the generation source. The waves propagated up to this line, then refracted, totally reflected, and turned back toward the shallow water. The experimental model not only successfully produces a caustic but also verifies the theoretical results near the caustic derived within the framework of a linear theory. The same bottom model was used to examine the refraction of transient wave groups. The transients were recorded at several places in the tank in such a way as to compare two alternative hypotheses: one that the waves refracted according to refraction equations involving their spectral phase speeds, and the other that group refracted pulsace specus, and the other that group velocities were involved. The wave groups were refracted according to the phase speeds of the spectral components. (Knapp-USGS) W72-12871 A NEW MATHEMATICAL MODEL FOR THE

VELOCITY DISTRIBUTION IN TURBULENT SHEAR FLOW, Agricultural Research Service, Oxford, Miss. Sedimentation Lab.

Journal of Hydraulic Research, Vol 10, No 2, p 205-225, 1972. 6 fig, 2 tab, 10 ref.

Descriptors: "Mathematical models, "Turbulent flow, "Velocity, "Diffusion, Uniform flow, Flow resistance, Shear drag, Non-uniform flow, Suspended load, Unsteady flow, Steady flow, Pipe flow, Open channel flow, Vicosity.

Identifiers: "Turbulent diffusion.

A mathematical model for the velocity distribution in turbulent shear flow was developed using an error function approximation to the distribution of the eddy viscosity or the turbulent momentum diffusion coefficient. The model agrees with Iusion coefficient. Ine model agrees with op-served velocity distributions from the top of the boundary layer to within the limits of velocity measurements near the solid flow boundary. The integral of the velocity distribution equation gives relative mean velocities or resistance relationships that are consistent with classical pipe flow data and that also permit the velocity distribution to be expressed in terms of boundary shear and bounda-ry roughness values. One of the main uncertainties concerning other models which use a parameter equivalent to k (the Von Karman constant) is the variability that is observed in the k values for dif-ferent flow conditions. The data presented for clear water flow suggest k values of about 0.28 for boundary layer flow, 0.33 for channel flow, and 0.37 for pipe flow. Secondary flows and the presence of suspended sediment may alter the apparent turbulent diffusion processes and give velocity distributions that suggest either different k values or different shear velocity values. (Knapp-USGS) W72-12872

WATER RESOURCES INVESTIGATIONS IN

WISCONSIN, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

WATER RESOURCES INVESTIGATION IN

WATER
VERMONT, 1968.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C. W72-12875

FLOODS IN MISSISSIPPI, OCTOBER 1967 THROUGH SEPTEMBER 1969, Geological Survey, Jackson, Miss. B. E. Wasson.

Mississippi Board of Water Commissioners Bulletin 72-1, April 1972. 40 p. 14 fig. 4 tab. 5 ref.

Descriptors: *Floods, *Rainfall-runoff relationships, "Streamflow, "Flood damage, "Mississippi, Tidal waters, Hurricanes, Flood stages, Flood profiles, Storms, Stream gages, Hydrologic data, Data collections, Flow duration, Discharge measurement.

Between October 1967 and September 1969, there were 10 noteworthy periods of flooding in Mississippi. The most notable of these was on August 17-18, 1969, when Hurricane Camille produced all-time record tidal floods along the Mississippi coast and killed 137 people and caused more than 510 million dollars in damage. Greater-than-50-year floods occurred on small streams in Wilkinson County as the result of 12 inches of rain on July 19 and 8 inches on July 23, 1969. Comparatively low floods occurred on Tombigbee River at Columbus on July 8-9, 1968, although the 24-hour total rainfall of 16 inches there was the greatest ever recorded in Mississippi. Split storm periods and the rapid dissipation of the flood flows of small streams draining into the Tombigbee River help to explain the minor flooding resulting from the in-tense rainfall. (Woodard-USGS)

SPEED CALIBRATION OF THE PLESSEY MODEL M021 SELF-RECORDING CURRENT METER.

Department of the Environment, Ottawa (On-tario). Inland Waters Branch.

Inland waters Branch.
H. S. Weiler, and N. De Zeeuw.
Canada Department of the Environment Inland
Waters Branch Technical Bulletin No 58, 1972. 14
p, 6 fig. 3 tab, 4 ref.

scriptors: *Current meters, *Stream gages, *Calibrations, *Low flow, *Canada, Methodology, Analytical techniques, Discharge measurement, Curves, Remote sensing.

Identifiers: *Current meters (Plessey Model

The Canada Center for Inland Waters has been using the Plessey Model M021 self-recording current meter since 1967. Because of the low speeds generally measured with this meter, a set of speed calibrations was made in the range of about 0 to 100 cm/sec. The current meters were calibrated at the 'Current Meter Rating and Experimental Sta-tion' at Calgary, Alberta. This station, established in 1911, is used by the Water Survey of Canada to rate current meters employed in stream measuring programs throughout Canada. Most care was exprograms throughout Canada. Most care was expended in carrying out calibrations in the range 3-15 cm/sec, since this was the range where the majority of measured values occurred. The calibrations were consistent in giving a straight line (first order) calibration curve, with a standard deviation of 0.3 cm/sec. Higher order calibration curves did not improve the fit; a lesser variance was achieved by splitting the calibration range of 0 - 70 cm/sec into two segments: 0 - 15, and 15 - 70 cm/sec. The method and equipment used, and the results obtained are described. (Woodard-USGS) W72-12879

STRUCTURE AND PROCESS IN A BRAIDED

RIVER, Ottawa Univ. (Ontario). Dept. of Geology. For primary bibliographic entry see Field 02J. W72-12882

2F. Groundwater

A DIMENSIONLESS PARAMETER STUDY OF GROUNDWATER RECHARGE, PHASE II, Oklahoma Univ. Research Inst., Norman. For primary bibliographic entry see Field 04B.

GROUNDWATER PRESSURE WAVE IN CON-FINED POROUS MEDIA, Idaho Univ., Moscow. Water Resources Research

Inst

G. L. Bloomsburg.

G. L. Bloomsburg.

Available from the National Technical Information Service as PB-211 279, \$3.00 in paper copy, \$9.95 in microfiche. Idaho University Water Resources Research Institute Project Report, July 1971. 5 p, 19 ref. OWRR A-031-IDA (1).

*Groundwater Descriptors: *Hydrogeology, *Idaho, *Confined water, *Water level fluctuations, Artesian aquifers, Water table. Identifiers: *Snake River Plain, *Pressure waves.

Literature concerning pressure waves in porous media is reviewed, and an example in the Snake River Plain is discussed. Two types of literature were required, one dealing with the groundwater hydrology of the Snake River Plain and the other

with the theoretical aspects of pressure wave movement in aquifers. The first report of a pres-sure wave phenomenon in the Snake River Plain appeared in 1965. The phenomenon was brought ut by extremely high flows in the Big Lost River during the summer of 1965. By December, 1965, the water table had risen more than 2 ft over a 400 sq mi area, and over part of this area had risen as much as 6 ft. The fact that the water table rose was not unexpected, but the rate at which it rose in areas considerably removed from the recharge area was unexpected. There is not enough information as yet to explain the phenomenon, and several statements have been made emphasizing the need for additional research. (Knapp-USGS)

MAJOR AQUIFERS AND SAND AND GRAVEL RESOURCES IN MARSHALL COUNTY, SOUTH DAKOTA, Geological Survey, Huron, S. Dak.

For primary bibliographic entry see Field 04B. W72-12412

GROUNDWATER LEVELS IN NEBRASKA-

-1971, Geological Survey, Lincoln, Nebr. For primary bibliographic entry see Field 04B. W72-12433

FORMATION AND DISTRIBUTION OF NATURAL FRESH GROUNDWATER RESOURCES ON THE ASIAN MAINLAND (O FORMIROVANII I RASPREDELENII YESTESTVEN-NYKH RESURSOV PRESNYKH PODZEMNYKH VOD AZIATSKOGO MATERIKA), N. A. Marinov, V. Z. Rubeykin, and R. I.

Byulleten' Moskovskogo Obshchestva Ispytateley Prirody, Otdel Geologicheskiy, Vol 47, No 1, p 108-120, January-February 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Asia, *Hydrogeology, *Ground-*Groundwater resources, *Groundwater basins, Groundwater availability, Groundwater movement, Subsurface runoff, Aquifers, Artesian aquifers, Rocks, Springs, Precipitation (At-mospheric), Water chemistry, Structural geology, Geologic mapping, Maps, Arctic Ocean, Indian Ocean, Pacific Ocean.

Identifiers: *USSR, *Black Sea, *Mediterranean *Artesian basins, Tectonics, Taliks,

The Asian continent is characterized by extremely diverse physiographic conditions and by a very complex geologic-tectonic structure, resulting in uneven distribution of groundwaters and in marked differences in groundwater flow. On the basis of groundwater flow, 5 hydrogeological provinces are distinguished: (1) the Arctic Ocean drainage, covering about one-fourth of the Asian continent and consisting of 5 large hydrogeological regions, including 28 artesian basins; (2) the Black and Mediterranean Sea drainage, covering less than 2% of the continent and comprising 4 than 2% of the continent and comprising 4 hydrogeological regions, including 8 artesian basins; (3) the drainage basin of the Asian heart-land, covering about 25% of the land mass and consisting of 9 large hydrogeological regions and 16 artesian basins; (4) the Indian Ocean drainage, covering about 20% of the continent and representing 11 hydrogeological regions, including 12 artesian basins; and (5) the Pacific Ocean drainage, covering about 25% of the continent and divided into 18 hydrogeological regions comprising 103 artesian basins. A sketch map showing hydrogeologic zoning of the Asian mainland is ac-companied by a map of groundwater availability. (Josefson-USGS) W72-12443

WATER RESOURCES INVESTIGATIONS IN PUERTO RICO, AND VIRGIN ISLANDS, 1969. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12444

WATER RESOURCES INVESTIGATIONS IN MICHIGAN, 1948.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.

WALER KESOURCES INVESTIGATIONS NEW YORK, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12446 WATER RESOURCES INVESTIGATIONS IN

WATER RESOURCES INVESTIGATIONS IN UTAH, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

WATER RESOURCES INVESTIGATIONS IN VIRGINIA, 1969. Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.

WATER RESOURCES INVESTIGATIONS IN WYOMING, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. For primar W72-12698

APPLICATION OF ARTIFICIAL RECHARGE TECHNOLOGY FOR MANAGING THE WATER RESOURCES - ANCHORAGE, ALASKA, Alaska Univ., College. Inst of Water Resources. For primary bibliographic entry see Field 04B. W72-12707

GROUNDWATER IN THE SANTA CRUZ VAL-LEY, ARIZONA, Arizona Univ., Tucson. Dept. of Soils, Water and Engineering bibliographic entry see Field 04B. W72-12850

GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1971. Geological Survey, San Antonio, Tex. For primary bibliographic entry see Field 04B. W72-12863

ESTIMATE OF SUBSIDENCE IN VENICE USING A ONE-DIMENSIONAL MODEL OF THE SUBSOIL, IBM World Trade Corp., Venice (Italy). Scientific

Center. G. Gambolati.

IBM Journal of Research and Development, Vol 16, No 2, p 130-137, March 1972. 7 fig, 6 tab, 19 ref.

Descriptors: *Land subsidence, *Withdrawal, *Groundwater, *Mathematical models, Aquifer characteristics, Water table, Hydrogeology. Identifiers: *Venice (Italy).

A one-dimensional model, based on the theory of vertical consolidation, is applied to the calculation of land subsidence in the Venetian Lagoon, which is caused by extraction of water from wells. Some assumptions are made in order to compensate for the scarcity of data. These assumptions are made

Group 2F-Groundwater

with regard to both the geophysical characteristics of the subsoil and the decline in piezometric level in the various strata. A direct correlation is shown between water extraction and surface subsidence. (Knapp-USGS) W72-12865

WATER RESOURCES INVESTIGATIONS IN WISCONSIN, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W72-12874

WATER RESOURCES INVESTIGATION IN VERMONT, 1968. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C.

W72-12879

W72-12883

GROUND WATER IN THE TORTUGUERO AREA, PUERTO RICO AS RELATED TO PROPOSED HARBOR CONSTRUCTION, Geological Survey of Puerto Rico, San Juan For primary bibliographic entry see Field 04B.

GROUND WATER ALONG RIO BUCANO AT PONCE, PUERTO RICO AND THE EFFECTS OF A PROPOSED FLOODWAY ON GROUND-WATER QUALITY. Geological Survey of Puerto Rico, San Juan For primary bibliographic entry see Field 04B.

CONCENTRATION GRADIENTS IN AQUIFERS, PHASE II, Tulsa Univ., Okla.

M. K. Kemp. Available from the National Technical Information Service as PB-211 542, \$3.00 in paper copy, 80.95 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, June 1972, 29 p, 7 fig, 11 tab, 26 ref. OWRR A-037-OKLA (1).

Descriptors: *Aquifers, *Thermal gradient, Ion exchange, Brine, Membrane processes, Electrolytes, *Bentonite, Heat transfer, *Ion transport. Identifiers: *Thermal pumping, Electrical poten-

The objectives of this project were to measure the electrical potential across sodium bentonite mem-branes due to a thermal gradient using sodium chloride solutions of various concentrations and combine these data with equations derived from the thermodynamics of irreversible processes to predict the rate of electrolyte transport. The electrical potential measurements have shown that for a 1/4 inch Wyoming Bentonite membrane and

sodium chloride solutions, the potential gradient, dE/dT, varies in a log-log fashion with concentration. Data are presented that can be used to esti-mate heats of transport, for the sodium ion assuming negligible water and chloride ion transport. The data collected thus far are not sufficient to indicate much about the transport mechanism in the mem-brane. Thus, the original objective of delineating the role of thermal pumping of electrolytes in the generation of observed concentration gradients in aquifers has not been attained. (See also W72-02055) W72-12952

2G. Water in Soils

tial, Potential gradient.

DIRECT METHODS OF SOIL MOISTURE ESTI-MATION FOR WATER BALANCE PURPOSES, M. Kutilek.

World Meteorological Organization Reports on WMO/IHD Projects, Report No 14, 1971. 58 p, 15 fig. 1 tab, 84 ref.

Descriptors: *Soil moisture, *Mapping, *Surveys, *Remote sensing, Aerial photography, Satellites (Artificial), Soil moisture meters, Vegetation effects, Infiltration, Evapotranspiration, Water balance, Hydrologic budget, International Hydrological Decade.

A method is proposed for direct measurement and estimation of soil moisture for large areas. The basis of the method is the point measurement of soil moisture at given stations. The measured values are extrapolated, and are correlated with the results of an areal determination of surface soil moisture. The extrapolation is based on maps of ecological classification of soil moisture and of hydrological types of soil water regime, on maps of texture, and on other maps from which the different types of soil moisture regime can be deduced. The areal study of surface soil moisture and the determination of the main hydrological factors causing the actual moisture of the soil use aerial photographs obtained from frequent aircraft this or from satellites. By mutual correlation of point measurements of moisture, extrapolated values, and soil surface moisture determined by areal methods, the moisture profiles and maps of soil water storage may be determined. (Knapp-USGS) W72-12417

INFILTRATION ANALYSIS II-SPRINKLIN-G-PLOT ANALYSIS, Ministry of Works, Wellington (New Zealand).

C. Toebes, and G. D. Mallinson.

New Zealand Ministry of Works Handbook of Hydological Procedures, Procedure No 22, (1971). 8 p, 7 fig, 9 ref, append.

Descriptors: *Soil water movement, *Infiltration, *Mathematical studies, Analytical techniques, Hydrologic data, Statistical methods, Rainfall, Soil properties, Hydrologic properties, Permeability, Depression storage, Runoff.

In determining soil infiltration rates, the sprin-kling-plot analysis can be used only when the rate of rainfall is uniform throughout the sotrm. The principle of the sprinkling-plot analysis is that sub-traction of the mass-runoff curve from the massrainfall curve results in a curve which represents surface detention, depression storage, and infiltration. A relationship is developed between the discharge after the end of rainfall (when the runoff is wholly from surface detention) and the surface detention, and this relationship is used for the cal-culation of surface detention during the entire storm. Subsequent correction for the surface detention and an estimated correction for the depression storage produces the infiltration curve. (Woodard-USGS) W72-12431

MICROFLORA OF SOIL AS VIEWED BY TRANSMISSION ELECTRON MICROSCOPY, Pennsylvania State Univ., University Park. Dept. of Microbiology.

For primary bibliographic entry see Field 05A. W72-12493

CAPACITY OF DESERT ALGAL CRUSTS TO FIX ATMOSPHERIC NITROGEN, Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils. For primary bibliographic entry see Field 05B. W72-12505

PREDICTION OF IRRIGATION ADVANCE FUNCTION BY DIMENSIONAL ANALYSIS, Indian Inst. of Tech., Kharagpur. Dept. of Agricul-

For primary bibliographic entry see Field 03F. W72-12518

PREDICTIONS OF AGRICULTURAL IRRIGA-TION FOR INDIANA AND IRRIGATION POTENTIALS OF SELECTED INDIANA SOIL Indiana State Dept. of Natural Resources, Indi-

anapolis. rimary bibliographic entry see Field 03F.

INFILTRATION RATE AND SEDIMENT PRODUCTION TRENDS ON A PLOWED BIG Utah State Univ., Logan. Dept. of Range Science.

G. F. Gifford. Journal of Range Management, Vol 25, No 1, p 53-55, January 1972. 1 fig, 2 tab, 5 ref.

Descriptors: *Sagebrush, *Infiltration rates, *Sediment load, *Runoff, Vegetation effects, Land use, Hydrologic properties, Regression anal-ysis, Arid lands, Xerophytes, Idaho.

Vast acreages of big sagebrush (Artemisia tridentata) have been sprayed, burned, plowed, railed, ripped or contour furrowed in the last 20 years. Surprisingly little information is available regarding the hydrologic consequences of this vegetation manipulation. This study was designed to provide additional information regarding the influence of plowing sagebrush on surface runoff and sediment production at a study site in southern Idaho. The ability to predict infiltration rates using cover characteristics alone varies with time both within a given storm event and on a seasonal basis. within a given storm event and on a seasonal basis. The trend was toward lowered infiltration rates following plowing and seeding of a big sage site. Sediment production rates increased following plowing, but yields were variable. Considering the variation, the ability to predict infiltration rates was not particularly affected by the plowing treatment. (Casey-Arizona) W72-12526

THE USE OF DETAILED SOILS INFORMATION FOR DELINEATING AND REGULATING FLOOD PLAINS: LEGAL AND ADMINISTRATIVE CONSIDERATIONS, Wisconsin Univ., Madison, Water Resources

For primary bibliographic entry see Field 06F.

W72-12654

DEVELOPMENT OF NEW TECHNIQUES FOR DELINEATION OF FLOOD PLAIN HAZARD ZONES - PART I: BY MEANS OF DETAILED SOIL SURVEYS - PART II: BY MEANS OF AIR-PHOTO INTERPRETATION, Wisconsin Univ., Madison. Water Resources

For primary bibliographic entry see Field 06F. W72-12655

SULFATE SALINIZATION OF SOILS IN THE AK-DAR'YA RAYON OF THE SAMARKAND OBLAST (O SUL-FATNOM ZASOLENII POCHV V AKDAR'INSKOM RAYONE SAMARKAND-SKOY OBLASTI), Selskokhozyaistvennyi Institut,

(USSR). For primary bibliographic entry see Field 03C. W72-12690

CONVECTIVE SALT ACCUMULATION IN THE CONVECTIVE SALT ACCUMULATION IN THE
CAPILLARY FRINGE PRODUCED BY SOILWATER EVAPORATION (KONVEKTIVNOYE
SOLENAKOPLENIYE V KAPILLYARNOYE
KAYME, VYZVANNOYE ISPARENIYEM
POCHVENNYKH VOD),
Institut Gidrodinamik, Novosibirsk (USSR).
For primary bibliographic entry see Field 02D. W72-12691

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SOME UNRESOLVED PROBLEMS IN SOIL SODIUM-CARBONATE SALINIZATION (O NEKOTORYKH NEYASNYKH VOPROSAKH SODOVOGO ZASOLENIYA POCHV), Akademiya Nauk SSSR, Moscow. Pochvennyi Institut

For primary bibliographic entry see Field 03C. W72-12692

RELATION OF THERMOPHYSICAL SOIL PROPERTIES TO MOISTURE TENSION AND WATER-FILM THICKNESS (ZAVISIMOST' TEPLOFIZICHESKIKH SVOYSTV POCHY OT DAYLENIYA VLAGI I TOLSHCHINY VODNOY

PLENKI) A VLAGI I IOLSK-HINI VODNOT PLENKI), Agrofizicheskii Nauchno-Issledovatelskii Insitut, Lenigrad (USSR).
A. M. Globus, and A. V. Aref'yev.
Pochvovedeniye, No 11, p 100-104, November 1971. 4 fig, 1 tab, 10 ref.

Descriptors: *Soil physics, *Physical properties, *Soil physical properties, *Thermal properties, *Moisture tension, Moisture content, Soil texture, Soil density, Bulk density, Thermal conductivity, Thermal capacity, Diffusivity, Podzols, Equations

Identifiers: *USSR, *Leningrad Oblast, *Water films, Moisture potentials, Sod-Podzolic soils.

Relationships of thermal conductivity, diffusivity, and heat capacity of medium loam, sandy loam, and sandy Sod-Podzolic soils in the Leningrad Oblast to moisture potential and reduced waterfilm thickness at different soil bulk densities are analyzed and graphed. Film thickness and bulk density account for the changes in thermal properior of the colle with chastier meisture souters. ties of the soils with changing moisture content and density. For a given bulk density, the relation-ship of thermal conductivity to film thickness can be approximated by a single curve for all 3 soils. For a given film thickness, the relationship of thermal conductivity and diffusivity to bulk density is nearly linear. A simplified relation between reduced thermal conductivity and film thickness, applicable to all soils studied, is obtained. (Josefson-USGS) W72-12693

HEIGHT OF THE CAPILLARY RISE OF WATER IN PEAT SOILS (O VYSOTE KAPILLYARNOGO PODNYATIYA VLAGI V TORFYANYKH POCHVAKH), Sarmenskaya Nauchno-Issledovatelskaya Stantsiya, Sarny (USSR).

A. S. Gordiychuk.
Pochyovedniye, No. 11, p. 91, 99, November 1971

Pochvovedeniye, No 11, p 93-99, November 1971. 3 fig. 1 tab. 13 ref.

Descriptors: *Soil physics, *Capillary action, *Capillary water, *Capillary fringe, *Peat, Bogs, Soil profiles, Soil physical properties, Soil compaction, Porosity, Moisture content, Groundwater, Water table, Height, Evaporation, Agriculture, Adoption of practices.
Identifiers: *USSR, *Ukraine, *Poles'ye, *Capil-

lary rise, *Soil monoliths, Lowmoor bogs.

The capillary rise of water in cultivated Peat soils of the 'Chemernoye' lowmoor bog in the Western Poles'ye of the Ukraine was investigated in laboratory and field experiments. Height of the capillary rise of water was determined in the laboratory in soil monoliths 50 cm x 50 cm in area and 50, 100, and 150 cm in depth. Maximum capillary rise of water in the 150-cm monolith was 120-122 cm; in the 100-cm monolith was 120-122 cm; in water in the 150-cm monolith was 120-122 cm; in the 100-cm monolith, 70-72 cm; and in the 50-cm monolith, 30-32 cm. Height of the capillary rise of water in the field was 87-110 cm when the ground-water depth was 120-160 cm. Compaction of Peat soil improves the capillary properties of the plowed layer. Maximum height of the capillary rise of water in plowed and conventionally rolled plots was 96 cm and in plowed and intensively rolled plots and disked plots, 115-118 cm. To determine the drainage rate for Peat soils, the root system must reach the upper boundary of the capillary fringe. (Josefson-USGS) W72-12694

NITROGE, PHOSPHORUS, AND POTASSIUM CONTENT IN ATMOSPHERIC PRECIPITATION IN BELORUSSIA (POSTUPLENIYE AZOTA, FOSFORA I KALIYA S ATMOSFERNYMI OSADKAMI V BELORUSSII), Belorusskii Nauchno-Issledovatelskii Institut Pochvovedeniya i Agrokhimii, Minsk (USSR). For primary bibliographic entry see Field 02B. W72-1269.

W72-12696

DEGRADATION OF ORGANOCHLORINE IN-SECTICIDES IN FLOODED SOILS IN THE PHILLIPPINES,
International Rice Research Inst., Los Banos,

Laguna (Philippines).
For primary bibliographic entry see Field 05B.
W72-12808

SOURCES OF SEDIMENT IN A MOUNTAIN RIVER BASIN,

Montana State Univ., Bozeman, Water Resources Research Center.

For primary bibliographic entry see Field 05B. W72-12817

STABILIZATION OF NEWLY FORMED SOIL AGGREGATES, Minnesota Univ., St. Paul. Dept. of Soil Science.

L. M. Arya, and G. R. Blake.

Agronomy Journal, Vol. 64, p. 177-180, March-April 1972. 4 fig., 2 tab., 8 ref. OWRR B-015-Minn (4).

Descriptors: *Soil aggregates, *Moisture content, *Stability, Soils, Cultivation, Plowing, Rain, Soil

Identifiers: *Thixotropic aging, *Aggregate formation and stabilization.

The stabilization of newly formed soil aggregates was observed. Stability of 3- to 5-mm diameter aggregates collected immediately after plow-shearing on four soil types increased with time after plowing when water content was held constant. The rate of increase was high during initial aging times and decreased as aging progressed. In-creases of about 0.17 for sandy soils and about 0.24 for finer-textured soils were observed in 72 hours of aging. For all soils, stability increase after about 10 to 12 hours was small. Earthworm casts were simulated by extruding kneaded, moist soil through a sieve with 2-mm round holes. Extrusions aged at four water contents showed considerable increases in relative stability in the 24-hour period following formation. Stabilities determined shortly after extrusion varied with water content of the extrusions. The largest change in stability was from 0.68 to 0.98 at a water content of 0.36 g/g. Aggregates were also prepared by placing water drops on dry soil powder and collecting the in-dividual coalesced portions. These aggregates were aged at two water contents. Initially, stabilities were near 0 but attained values ranging from 0.14 to 0.31 in about 120 hours. Stability differences due to water content were inconclusive.
(Walton-Minnesota) W72-12819

SPATIAL VARIABILITY OF UNSATURATED

HYDRAULIC CONDUCTIVITY, Arizona Univ., Tucson. J. G. Stockton, and A. W. Warrick. Soil Sci Soc Am Proc. Vol 35, No 5, p 847-848.

Identifiers: *Soil physical properties, *Hydraulic conductivity, Moisture, Pressure, Soils, Spatial distribution, Variability.

Spatial variability of unsaturated hydraulic conactivity was studied for 40 ha of Pima clay loam. ductivity was studed for 40 ha of Pima clay loam. Calculations of hydraulic conductivity were based on the moisture release data using a modified Millington-Quirk equation. One standard deviation to either side of the average moisture release curve resulted in a 20-30% variation in the unsaturated hydraulic conductivity. This offers a relatively quick and easy method for estimating variability of unsaturated hydraulic conductivity variation from pressure head we moisture relatives. Input needed pressure head vs. moisture relations. Input needed for application: moisture release relations and their variances.--Copyright 1972, Biological Abstracts, Inc. W72-12820

PROBLEMS AND TRENDS IN DRAINAGE RESEARCH, MIXED BOUNDARY CONDI-Iowa State Univ. of Science and Technology, Ames.

For primary bibliographic entry see Field 04A.

W72-12823

POLYSACCHARIDES IN MOLASSES MEAL AS AN AMELIORANT FOR SALINE-SODIC SOILS COMPARED TO OTHER RECLAMATION

Stellenbosch Univ. (South Africa). Dept. of Soil

H. W. Weber, and P. C. Van Rooyen. Geoderma, Vol. 6, No. 4, p. 233-253, December 1971. 17 tab, 18 ref.

Descriptors: *Soil amendments, *Soil aggregates, *Arid lands, *Alkaline soils, *Soil moisture, Saline soils, Irrigation systems, Sodium, Potassium, Hydrogen ion concentration, Sodium, Potassium, Hydrogen ion concentration, Soil chemical pro-perties, Soil physical properties, Soil management. Identifiers: *South Africa, *Molasses meals, *Sodium adsorption ratio, *Polysaccharides.

In South Africa, as well as in other arid and semiarid areas, large acreages of structurally severely deteriorated brack (sodic) soils occur which have been abandoned. This situation usually has come about as a result of over-irrigation or of irrigation with saline waters. Such soils are often reclaimed by the use of soil amendments such as gypsum, by the use of son amendments such as gypsum, suffur, potassium sulfate or manure. It is a well-established fact that polysaccharides and polyuro-nides in soils promote the formation and stabiliza-tion of soil aggregates. Using molasses meal, a study was undertaken to evaluate the effect of polysaccharides on the physical properties of sodic soils compared to the commonly used bracksoil amendments. Sandy loam saline-sodic soils were used, and the experiment was conducted with a minimum of irrigation under the rigidly arid with a minimum of irrigation under the rightly and conditions of the southern Cape Province. All measured factors were subjected to analyses of variance. Results proved both instant and long term effectiveness of molasses meal and its superiority to the other ameliorants. Soil physical pro-perties were drastically improved while most critical chemical properties were unchanged. It was tentatively concluded that the polysaccharide aggregating powers were greater than the Na ion dispersing forces in the soil. (Casey-Arizona) W72-12825

THE DETERMINATION OF HYDRAULIC CON-DUCTIVITY AND DIFFUSIVITY OF UNSATU-RATED SOILS,

Agricultural Research Service, Fort Collins, Colo. A. Klute. Soil Science, Vol. 113, No. 4, p. 264-276, April

1972. 2 tab, 63 ref.

Group 2G-Water in Soils

Descriptors: *Soil physics, *Soil water movement, *Unsaturated flow, *Hydraulic conductivity, *Diffusivity, Soil types, Infiltration, Moisture tension, Profiles, Estimating equations, Flow measurement, Flow characteristics, Flow profiles, Variability

Identifiers: *Moisture retention, *Soil water dif-

In order to quantitatively apply the theory of un-saturated flow to field or laboratory flow systems, knowledge is required of the moisture and hydraulic flow characteristics of the soils involved. The methods available for measurements of these parameters are reviewed. Steady-state methods are handicapped by the relatively long times needed to establish steady flow, the difficulties of obtaining conductivity-water-content functions, and the fact that they are primarily laboratory methods. Unsteady-state methods may be grouped into outflow-inflow methods and instantaneous profile methods, all of which are characterized by the time dependence of some aspect of flow system behavior to obtain conductivity or soilwater diffusivity. Calculation of conductivity from water retention data is also discussed. If one wishes to verify the validity of flow concepts as applied to a particular flow system, then one needs more precise measurements of a relatively small number of samples. For prediction of soil-water behavior in field situations, the problem of soil variability dictates the need for extensive methods for characterizing the field soil. Meaningful average conductivity functions and probability statements as to the deviations from the average conductivity function are required. (Casey-Arizona)

THE IMPACT OF L.A. RICHARDS UPON THE FIELD OF SOIL WATER PHYSICS, Wisconsin Univ., Madison. Dept. of Soil Science.

W. H. Gardner. Soil Science, Vol 113, No 4, p 232-237, April 1972.

Descriptors: *Soil physics, *Soil moisture, *Soil properties, *History, Unsaturated flow, Darcys aw, Saline soils. Identifiers: *Soil water potential.

L. A. Richards was and is one of the most influential practitioners in the field of soil physics, and many of his accomplishments are briefly recounted. In 1928, he proposed and illustrated a tension plate apparatus for the determination of the capillary potential of soil samples. He also urged extension of Darcy's Law to unsaturated flow problems. He worked to develop methods of measuring both the capillary and total potentials. He was influential in the development and spread of energy potential concepts of soil water and its measurement by the phychrometer. His debate with Veihmeyer on soil water availability illu-minated many important concepts. He edited the soil salinity handbook of the U.S. Salinity Laboratory and developed the saturation extract method of measuring soil salinity. (Casey-Arizona)

PHYSICO-CHEMICAL AND PHYSICAL. CHANGES IN THE PROFILE OF A SODIC SOIL TREATED WITH GYPSUM, Commonwealth Scientific and Industrial Research

Organization, Deniliquin (Australia). Rivernina Lab.

M. L. Sharma.

Australian Journal of Soil Research, Vol 9, No 2, p 73-82, December 1971. 5 fig, 2 tab, 18 ref.

Descriptors: *Alkaline soils, *Salinity, *Hydrogen ion concentration, *Reclamation, Water storage, Conductivity, Hydraulic conductivity, Soil struc-ture, Soil properties, Soil water movement, Soil physical properties.

No quantitative information regarding long-term changes in physical or physico-chemical properties is available for gypsum treated sodic soils which have been maintained under irrigated pasture. Soil properties of a brown sodic soil, measured 40 months after a gypsum treatment are reported and discussed and compared with the results of some measurements made 7 months after treatment. Gypsum effects extended down to after treatment. Gypsum effects extended down of 30 cm compared to 15-20 cm after 7 months. Leaching effects would be seen as salt movement while plant root respiration would release carbon dioxide into the soil which would hydrolyze, lowering pH. Electrical conductivity (EC) changes towering prin. Electrical conductivity (EL) changes were found at 40 cm depths while pH decreased in the 15-30 cm layer. pH was significantly reduced in the surface layer of control plots, but salinity, or EC, was increased. Field measurements indicated increased water penetration and storage as a result of gypsum treatments and this was confirmed by lab studies which showed increased hydraulic con-ductivity as a result of improved soil structure. (Casey-Arizona) W72-12833

APPLICATION OF FLOW THEORY TO FIELD

STITUATIONS, California Univ., Davis. D. R. Nielsen, J. W. Biggar, and J. C. Corey. Soil Science, Vol 113, No 4, p 254-263, April 1972.

Descriptors: *Soil water movement, *Soil physics, Diffusivity, *Darcys law, *Hydraulic conductivity, Saline soils, Unsaturated flow, Drainage, Hysteresis, Soil moisture, Mathematical models, Tensiometers, Moisture content.

Identifiers: *Soil water retention, *Soil water Identifiers: *Soil water repotential, *Matric potential.

The contributions of L. A. Richards, many of which are reviewed, make it possible to measure and predict soil water movement. Less than 5% of all articles written in soil, water and crop research journals contained analytic measurement or prejournals contained analytic measurement of production of soil water retention. The development of tensiometers made possible measurements of hydraulic conductivity as a function of water content or matric potential. Because of the heterogeneous nature of field soils in the vertical directive control of the control of th direction owing to genetic horizons or poorly defined layers stemming from alluvium, prediction of soil water movement is difficult, and best ac-complished under field conditions, using analytical or numerical solutions of Darcy-type equations, or obtained with either laboratory- or field-measured values of the hydraulic conductivity. The study of soil water movement with such methods may also be of much use in studying soil salinization problems, particularly soluble salt transfer in un-saturated soils. (Casey-Arizona)

DECOMPOSITION AND BINDING ACTION OF POLYSACCHARIDES IN SOIL, California Univ., Riverside. Dept. of Soils and

Plant Nutrition. J. P. Martin.

Soil Biology and Biochemistry, Vol 3, No 1, p 33-41, February 1971. 1 fig, 1 tab, 65 ref.

Descriptors: *Soil physical properties, *Soil aggregates, *Soil chemical properties, Soil gregates, *Soil chemical properties, Soil microbiology, Humus, Soil structure, Soil treatment, Cations, Clay minerals, Identifiers: *Soil polysaccharides.

Soil humus contains polysaccharides which quantitatively are the second most important com-ponents of the soil organic fraction. The polysaccharides appear to be active in soil ag-gregate formation or binding of soil particles and are probably important in chelation and exchange reactions related to active constituents such as uronic acids. The available evidence indicates that most plant or microbial polysaccharides are largely decomposed in soils within a few weeks to a few ly decomposed in soils within a few weeks to a few months. A few are more resistant, lasting much longer, and are possibly of relatively greater im-portance than those more readily utilized. Many polysaccharides are adsorbed by clay minerals while others which contain uronic acid groups may form salts or complexes with metal cations. Such chemical combinations may increase their re-sistivity to breakdown. Although much has been learned about different structural units and their origins and relations with other soil constituents, much is yet to be done, particularly recovery of relatively unaltered preparations. The probable mechanisms of the polysaccharide binding action are reviewed. (Casey-Arizona)
W72-12836

CONCEPTS OF SOIL WATER PHENOMENA, Agricultural Research Council, Cambridge (England). Unit of Soil Physics. E. C. Childs.

Soil Science, Vol 113, No 4, p 246-253, April 1972. 2 fig, 29 ref.

Descriptors: *Soil water movement, *Pore water, *Soil physics, *Mathematical models, *Hydraulic conductivity, Darcy's Law, Membrane processes, Conduction, Diffusivity, Infiltration, Capillary water, Laplaces equation.
Identifiers: *Soil water diffusivity, *Domain dia-

Soil water has been divided into 3 classes: hygroscopic, gravitational and capillary. Such concepts suffer from imprecise definitions which preclude precise measurement. Such criticisms also apply to the concepts of field capacity and permanent wilting percentage. The measurement of soil water properties reduces to the twin problems of measurement of soil water properties reduces to the twin problems of measurement of soil water properties reduces to the twin problems of measurement of soil water properties reduces to the twin problems of measurement of soil water properties reduces to the twin problems of measurement of soil water properties reduces to the twin problems of measurement of soil water problems of measur properties reduces to the twin problems of mea-suring pore water suction and plotting the relation-ship between this and the pore water content, first, and secondly, interpreting the curves that result. Elucidation of the static equilibrium requires definitions of pore water pressure which can be measured by permeable or semi-permeable mem-brane studies. Geometrical interpretations of the pore space can only be qualitative, so domain concepts must be used. A simple domain diagram of drying and wetting suction, is presented and in-terpreted. While soil water movement can be described by Darcy's Law, which is a part of general conduction theory, it is cautioned that features of gravity, pore water content and hysteresis distinguish soil water flow from other branches of conduction theory. Bearing in mind these features, Darcy's Law is developed for a variety of situa-tions. (Casey-Arizona) W72-12837

FUTURE PROBLEMS OF SOIL WATER

RESEARCH,
Commonwealth Scientific and Industrial Research
Organization, Canberra (Australia). Div. of Environmental Mechanics.
J. R. Philip.

Soil Science, Vol 113, No 4, p 294-300, April 1972.

Descriptors: *Soil water, *Soil water movement, *Soil physics, *Research priorities.

After a brief review of L.A. Richard's scientific research, 5 fields are identified in which it is felt that significant progress is possible in the next decade: the stability of soil water flows, the dispersion of solutes by convection and molecular diffusion in porous media, solute-induced flow and transport, water movement in saturated and unsaturated swelling soils, and electric double layers on soil colloids. The future of soil water research is confronted with several general problems and 3 of these are described. The problem of diminishing returns or when to stop pursuing a given research avenue is too often not considered, despite the combination of increas-

ingly difficult research data leading to increasingly irrelevant or unusable results. The problem of transferring the scale of soil water research from transferring the scale of soil water research from the small local process to the large-scale river basin or ecosystem must eventually be faced. Finally, the social problem of decreased social support for science and the closing of the entry of the young into research is especially serious. (Casey-Arizona) W72-12838

WATER RETENTION IN SOIL, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Env. vironmental Mechanics; and Agricultural Univ., Wageningen (Netherlands). Lab. of Soils and Fer-

Billers.
P. H. Groenevelt, and G. H. Bolt.
Soil Science, Vol 113, No 4, p 238-245, April 1972.
3 fig, 21 ref.

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Descriptors: *Soil physics, *Soil water movement, *Tensiometers, *Saturated flow, *Chemical potential, Soil water, Mathematical analysis, Hysteresis, Thermodynamic behavior, Moisture content, Moisture tension.

Identifiers: *Soil water potential, *Matric potential, *Soil water retention.

The concept of the capillary potential of soil water and its generalization in terms of matric potential have provided a rigorous thermodynamic basis for soil water retention. Soil water potential may be expressed in terms of its component water potentials: matric, solute, temperature, external (gas) pressure and truly external force fields (such as gravity). The operation of the tensiometer is then explained in terms of its water retention properties. Even when hystersis is left out, the situation explained in terms of its water retention properties. Even when hysteresis is left out, the situation
is much more complicated in swelling soils.
Because of changes in geometry, it seems advantageous to express the moisture content in
terms of a moisture rate of cu cm of water per cu
cm of solid. Thus, the system can then be characterized by 2 independent parameters and 2 dependent parameters. Equations are developed leading
to families of curves of the void ratio and the
moisture ratio as functions of the load pressure.
(Casey-Arizona)
W72-12839

THE ROLE OF MICROORGANISMS IN THE STABILIZATION OF SOIL AGGREGATES, Wisconsin Univ., Madison. Dept. of Bacteriology; and Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 05B. W72-12857

INTENSITY OF SOIL DEFLATION,

A. M. Krivenkov Probl Osvoeniya Pustyn, 3, 65-72, English summa-

Descriptors: *Soil, *Erosion, *Soil stability, Soils, Water table, Vegetation, Wind velocity, Moisture content.

Resistance of soils to deflation (erosion) was quantitatively estimated on semi-permanent sample plots. The deflation rate was dependent on the substrate, wind velocity, water table, moisture content, density, nature of vegetation, and other natural factors. The annual rate varied from 0.1 cm on periodically moistened solonchaks to 7.1 cm on loose sandy deposits.—Copyright 1972, Biological Abstracts, Inc.

W72-12890 Resistance of soils to deflation (erosion) was quan-

HYSTERESIS IN CALCULATIONS OF SOIL MOISTURE REDISTRIBUTION, S. V. Nerpin, G. S. Reznik, and G. I. Yuzefovich. Sb Tr Po Agron Fiz. 23. p 4-17. 1969.

Identifiers: Calculations, Distribution, *Hysteresis, *Soil moisture, Moisture profile.

The movement of moisture in soil allowing for hysteresis, described by the nonlinear diffusion equation, is discussed. The different processes are indicated by the position of the inflection point in the moisture profile at every moment of time. The resultant numerical solution shows that in the absence of evaporation and for given diffusion coefficients, the redistribution of moisture in soil is more rapid when hysteresis is considered—Copyright 1972, Biological Abstracts, Inc. W72-12891

SOIL CHARACTERISTICS AND SUBSURFACE SEWAGE DISPOSAL, Department of Agriculture, Guelph (Ontario). For primary bibliographic entry see Field 05B. W72-12913

MIGRATION OF SUBSTANCES IN BROWN FOREST SOILS, L. Reintam, I. Rooma, and E. Arvisto. Sb Nauchn Tr Est S-Kh Akad. 65. p 163-187. 1970.

English summary. Identifiers: *Forest soils, Formation, Humus, Lysimeters, *Migration, Seasonal, Soils, Sub-

The migration of substances was studied by insertion into the soil of Al2O3 (chromatographic grade), KU-2 cation-exchange resin and microlysimeters. Accumulation processes predominate in brown forest soils, the bulk of Fe and Fe-organic complexes being fixed in the soil.

A considerable part of the total migrating Fe consists of the free forms extracted with 1 N H2SO4, while free Fe extracted by 0.1 N H2SO4 is completely absent in certain periods. Free Fe migrates in summer. The importance of Fe-organic complexes increases in winter. The amount of subcomplexes increases in whether the amount of sustances retained by sorbents is always larger than in lysimetric waters. Substances are evidently transported by capillary waters. Mobile organic matter formed in the forest floor becomes fixed in underlying horizons. The formation of mobile humus is less in the 6 cold mo. of the year, and its first in the state of the profile and the state of th fixation is weaker. The entire soil profile is ap-preciably decalcified.—Copyright 1972, Biological Abstracts, Inc. W72-12914

WATER, THERMAL AND AIR REGIME OF BROWN SOILS, K. Roostalu, Y. Enni, and R. Okk. Sb Nauchn Tr Est S-Kh Akad. 65. p 144-162. 1970.

English summary.
Identifiers: *Soil properties, Air, *Brown soils,
Oak D, Soils, Spruce G, Soil moisture, Tempera-

The leached and typical brown soils are well provided with a comparatively abundant water supply, the moisture content of horizon Bt dropping below wilting point only during drought. The relative moisture content of typical brown soils very rarely falls below 50-60%, with greater water consumption at the beginning of the growing season in spruce stands and in the second half of summer in oak stands. The amount of available moisture under oak is 25 mm less than under spruce, from July on. Appreciable warming of typical brown soils begins nearly 2-3.5 wk earlier than in leached brown soils. The active temperature period at depth 25 cm is 1-2 wk longer under oak than under spruce on typical brown soil and nearly period at depth 25 cm is 1-2 wk longer under oak than under spruce on typical brown soil and nearly 1 mo. longer on leached brown soil. The CO2 content in the air of typical brown soils under oak reaches 1.35%, and seldom exceeds 0.5% in leached brown soil. Maximum CO2 liberation by brown soils occurs during the growing season.—Copyright 1972, Biological Abstracts, Inc. W72-12916

DDT-DEHYDROCHLORINASE FOR IDENTIFI-CATION OF DDT IN SOIL, Alberta Univ., Edmonton. Dept. of Entomology. For primary bibliographic entry see Field 05A. W72-12934

EFFECT OF STEEPNESS AND LENGTH OF SLOPE ON SOIL LOSS, College of Agriculture, Gwalior (India).

H. B. Battawar, and Y. P. Rao.

Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J. Vol 4, No 1/2, p 46-51. 1970 (1971). Illus.

Identifiers: "Erosion, Length, Loss, "Slope, Soils Steepness."

Runoff was studied on plots of 2% slope with 60-m length, 3.5% with 45-m length and 5% slope with 30-m length with paddy crop. With the increase in the degree of slope even when the length was reduced, soil loss increased rapidly.—Copyright 1972, Biological Abstracts, Inc. W72-12936

CANNERY WASTE DISPOSAL ON LAND, Guelph Univ. (Ontario). Dept. of Soil Science. For primary bibliographic entry see Field 05D. W72-12969

CHARACTERISTICS OF THE WATER REGIME IN WEAKLY PODZOLIC SANDY SOILS OVER-LYING THICK SANDS IN THE SOUTHWESTERN ZONE OF THE EUROPEAN PART OF THE USSR,
A. A. Kolosova.
Tr. Novozybkovsk S-Kh Opytn Stn Vses Nauchno-Issled Inst Udobr Agropochvoved. 3. p 313-339, 1969.

313-339, 1969.
Identifiers: *Precipitation (Atmospheric),
Moisture deficit, *Podzols soils, *Sands, Soils,

Summer precipitation plays an insignificant and transient part in the wetting of these sandy soils. In spite of autumn precipitation, the soils often form a dry layer at depths of 50-70 or 90-100 cm, which persists till spring. The water balance remains precarious with a permanent moisture deficit throughout the growing season, irrespective of the amount of summer precipitation.—Copyright 1972, Biological Abstracts, Inc.

W72-12975

CONTRIBUTION TO THE STUDY OF THE IN-FLUENCE OF SOIL ON VEGETATION IN FOREST-SAVANNA CONTACT OF WESTERN AND GENERAL IVORY COAST,

M. Digerdil Latham. Adansonia. Vol 10. No 4, p 553-576. 1970. Illus.

Identifiers: Climate, Contact, *Soil fertility, Forests, *Ivory Coast, *Soil moisture, *Forest Savanna, Soil, Vegetation.

The transition between semi-deciduous forest and savanna in central Ivory Coast may be due to cli-matic causes, distinction is not sharp. Comparison of the quantitative relief of vegetation and characteristics of soil show: a significant relation between well managed water reserve and types of vegetation, saturation of the soil in the formation of certain herbaceous savannas, and a probable relationship between chemical fertility of soils and vegetation.—Copyright 1972, Biological Abstracts, Inc. W72-13023

2H. Lakes

EFFECT OF SPECTRAL COMPOSITION ON PHOTOSYNTHESIS IN TURBID RESERVOIRS—PHOTOSYNTHETIC PRODUCTION IN A

Group 2H-Lakes

TURBID RESERVOIR II. DETAILS OF AN INCUBATION MODEL AND COMMENTS ON THE EFFECT OF LIGHT QUALITY ON PHOTOSYNTHESIS, Kansas Water Resources Research Inst., Manhat-

For primary bibliographic entry see Field 05C.

LAKES OF WEST VIRGINIA, West Virginia Dept. of Natural Resources, Char-leston. Div. of Water Resources. For primary bibliographic entry see Field 06D. W72-12397

PEACE VALLEY AQUATIC RECREATION AREA, RECREATION DEVELOPMENT PLAN, California State Dept. of Water Resources, Sacra-For primary bibliographic entry see Field 06B.

A METHOD FOR FORECASTING ANNUAL IN-FLOW OF WATER TO LAKE SEVAN (METOD PROGNOZA GODOVOGO PRITOKA VOD V OZERO SEVAN), Zakaykazdiji

Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.

THERMAL REGIME OF WATERS NEAR THE THERMAL REGINE OF THE CASPIAN SEA (OSOBENNOSTI TERMIKI VOD U VOSTOCHNOGO POBEREZH'YA KASPIYSKOGO MORYA), Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR). For primary bibliographic entry see Field 02E. W72-12441

SURFACE DISCHARGE OF HEATED WATER, Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab For primary bibliographic entry see Field 05B.

COMPARISON OF THERMAL DATA FROM AIRBORNE AND VESSEL SURVEYS OF LAKE

Wisconsin Univ., Milwaukee. Center for Great Lakes Studies. For primary bibliographic entry see Field 05A. W72-12455

A PROGRAM TO ASSESS THE THERMAL DISCHARGE FROM A PLANNED NUCLEAR POWER PLANT ON CAYUGA LAKE, Cornell Aeronautical Lab., Inc., Buffalo, N.Y. For primary bibliographic entry see Field 05B. W72-12456

SIMULATED THERMAL EFFLUENT INTO LAKE ONTARIO,
Toronto Div. of Sanitary Engineering (Ontario).
Water Quality Surveys Branch.
For primary bibliographic entry see Field 05B.
W72-12457

FRESH WATER AND ESTAURINE SPECIFIC GRAVITY DIAGRAMS, State Univ. Coll., Fredonia, N.Y. For primary bibliographic entry see Field 05A.

SATELLITE MEASUREMENT OF LAKE-SU-RFACE TEMPERATURES, Allied Research Associates, Inc., Concord, Mass.

In: Proceedings 12th Conference on Great Lakes Research, University of Michigan, Ann Arbor, Michigan, May 5-7, 1969, p 558-563. 12 ref.

Descriptors: *Remote sensing, *Water temperature, *Satellites (Artificial), *Thermal pollution, Cloud cover, *Lakes, Infrared radiation. Identifiers: Absorbing gases, Spatial resolution.

Monitoring of thermal pollution, providing data for circulation models and for fish prediction ser-vices, and meteorological applications are a few important uses of lake-surface temperature measurements. An IR satellite system is inherently cloud cover limited. Because of the presence of absorbing gases in the atmosphere between the lake surface and the spacecraft. IR sensors measure a temperature which is less than the true temperature of the surface. If the vertical distribution of these absorbing gases is known, the tempera-ture correction can be determined. Wherever a cloud falls within the field of view of the satellite radiometer, the recorded temperature will be inter-mediate between that of the lake surface and that of the cloud top. Ways which have been devised to circumvent this problem include the establishment of a temperature threshold, composite mapping, and more complicated multispectral techniques. A brief description of the equipment aboard the TIROS and NIMBUS meteorological satellites is given. Future satellites should provide improve-ments in spatial resolution to make the study of smaller bodies of water possible and atmospheric sounding techniques and multispectral sensing to overcome the problems of absorbing gases and cloud contamination. (Upadhyaya-Vanderbilt)

BIOLOGIC CHARACTERISTICS OF THE CASPIAN STURGEONS (FAMILY ACIPENSERIDAE) AND THEIR USE IN THE REPRODUCTIVE REPLETION OF STOCK, Tsentralnyi Nauchno-Issledovatelskii Institut Osetrovogo Khozyaistva, Baku (USSR). Azerbaidshapekre Otteleira haidzhanskoe Otdelenie

baidzhanskoe Oucienie.
M. I. Legeza.
Vopr Ikhtiol. Vol 11, No 3:, p 447-456, 1971. Illus.
Identifiers: *Fish management, Fish reproduction,
Fish stocking, Acipenser nudiventris, Acipenseridae, Biology, Caspian basin, Repletion,
Reproduction, *Sturgeons.

Studies on the nutritional factors, spawning habits, and growth rates of various members of the nantis, and growth rates of various members of tune sturgeons in the Caspian basin led to the following recommendations for reproductive repletion of sturgeon stocks. Controlled reproduction should be conducted to assure that about 60% of the stur-geons family population consisted of sturgeons, approximately 20% of starred sturgeon, about 15% of beluga, and around 5% of Acipenser nudiven-tris. In order to transform the Caspian basin into a sturgeon reservoir. the fish industry should select sturgeon reservoir, the fish industry should select means that will allow the highest population of sturgeon and low levels of beluga.—Copyright 1972, Biological Abstracts, Inc. W72-12537

AN OBSERVATION OF MASS MORTALITY OF NILE PERCH (LATES SP.) ON LAKE ALBERT, UGANDA, I. S. C. Parker.

East Afr Agric For J. Vol 36, No 4:, p 419-421. Identifiers: *Fishkill, *Earthquakes, Lake Albert, *Lates p, Mortality, *Perches, Uganda.

An observation of mass mortality of Lates in Lake Albert is described. That this had been a relatively

Albert is described. Inat this had been a relatively frequent phenomenon (Worthington, 1929; Greenwood, 1958) is noted. The circumstances surrounding the instance recorded do not support previous ideas put forward to explain it. The observation that Lake Albert lies in an area of contribution of the contr siderable seismic activity, together with the occurrence of an earth tremor immediately prior to the mortality recorded, suggest a relationship between the 2 phenomena. The hypothesis is therefore presented that seismic activity is the most likely cause for the frequent mass mortalities of Lates in Lake Albert.--Copyright 1972, Biological Abstracts, Inc. W72-12538

INTERRELATIONS AMONG PLANKTON, ATTACHED ALGAE, AND THE PHOSPHORUS CYCLE IN ARTIFICIAL OPEN SYSTEMS, Ithaca Coll., N.Y. Dept. of Biology. For primary bibliographic entry see Field 05C. W72-12543

INTERNATIONAL SYMPOSIUM ON WATER POLLUTION CONTROL IN COLD CLIMATES. Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 05C. W72-12548

SYNOPTIC STUDY OF ACCELERATED EUTROPHICATION IN LAKE TAHOE--AN AL-PINE LAKE, California Univ., Davis. Inst. of Ecology. For primary bibliographic entry see Field 05C.

W72-12549

THE SOUTH BASIN OF LAKE WINNIPEG - AN ASSESSMENT OF POLLUTION, Department of Mines and Natural Resources, Winnipeg (Manitoba). Fisheries Branch. For primary bibliographic entry see Field 05C. W72-12550

EUTROPHICATION IN SOME LAKES AND COASTAL AREAS IN FINLAND, WITH SPECIAL REFERENCE TO POLYHUMIC LAKES, Helsinki Univ. (Finland). Dept. of Limnology. For primary bibliographic entry see Field 05C. W72-12551

THE RECOVERY PROCESS OF A LAKE WHICH RECEIVED WASTEWATER FROM AN ORE DRESSING PLANT, Swedish Water and Air Pollution Research Lab., Stockholm. For primary bibliographic entry see Field 05C. W72-12552

PHOSPHORUS BINDING MECHANISMS DURING SELF-PURIFICATION OF POLLUTED LAKES. Swedish Water and Air Pollution Research Lab.,

Stockholm. For primary bibliographic entry see Field 05C. W72-12557

GONADAL RESORPTION IN CERTAIN SEMI-MIGRATORY FISHES OF ARAKUM RESER-VOIRS (DAGESTAN ASSR) DUE TO REGULA-TION OF WATER FLOW, M. M. Shikhshabekov.

Vopr Ikhtiol. Vol. 11, No. 3, p 526-530. 1971. Illus.

Map.
Identifiers: *Fish reproduction, *Fish migration, Arakun, Carp, Dagestan ASSR, Fishes, Flow, *Gonads, Regulation, Reservoirs, *Resorption, Shiners, USSR.

Long-term investigations were undertaken to determine the effects of controlled water flows in the Arakum reservoirs in Dagestan on the sexual cycle of vobla, golden shiner, and carp from 1966 to 1969. Histologic investigations on the sex organs of 2-5 yr old vobla, 3-6 yr old carp, and 3-8 yr old golden shiner showed that full development of the gonads and completion of the sex cycle is

strongly dependent on environmental conditions. The fish must be able to reach the spawning grounds prior to exposure to spawning temperature. Regulation of water flow with locks prevents migration of these semimigratory fishes and leads to massive resorption of the gonads and subsequent decrease in the fish population.—Copyright 1972, Biological Abstracts, Inc. W72-12577

SOME DATA ON THE AGE AND GROWTH OF STIZOSTEDION LUCIOPERCA L. AND ESOX LUCIUS L. FOUND IN THE LAKE LION, Vysoka Skola Polnohospodarska, Nitra (C-zechoslovakia). Katedra Drobnych Hospodarska

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Biologia (Bratisl). Vol 26, No 8: p 627-634, 1971. Illus. (English summary).

Identifiers: *Fish physiology, Age, Czechoslovakia, *Esox lucius, *Growth, Lakes, *Lion, Lake (Czech), *Stizostedion lucioperca.

An estimation is given of the ages and growth of S. lucioperca L. (122 specimens of ages 1-9 yr and of body lengths 147-755 mm) and of E. lucius L. (90 specimens of ages 1 to 6 yr and of body lengths 175-780 mm). Various indices, both absolute (increments to lengths and weights of bodies in mm and g, respectively) and relative (increase in lengths in single years expressed as % of the length in the first growing period, and increase in length in single years compared to the average growth of the whole population) are evaluated. Fishhooks were used to obtain the material of both species, so that only a fragment of the population was involved.-Copyright 1972, Biological Abstracts,

Inc. W72-12624

RATE OF POPULATION OF LAKES WITH PERCH (PERCA FLUVIATILIS L.), Siberian Research Inst. of Pisiculture, Tyumen (USSR).

. S. Mukhachev.

Vopr Ikhtiol. Vol 11, No 3, p 522-524. 1971. Identifiers: Fish establishment, Fish populations, Fish stocking, Lakes, *Perca fluviatilis, *Perches,

The periodically fish-killing Transural lakes provide natural laboratories for investigations on the dynamics of limnophilic fish populations and their interrelationships. It has been observed that when high water returns and lakes are artificially replenished with perch, the fish increase in weigh 4-5 fold after 1 summer. It has been established that introduction of P. fluviatilis rapidly turns such lakes into perch reservoirs. A case in point is Lake Smolino in which a few hundred specimen were in-troduced by the local fishermen in 1958-1959. By 1964 perch accounted for 50% of all the catch, and by 1968 the vast majority of the fish caught were perch. Such findings have also been observed with other lakes in the Transural region and point to the need for ichthyological consultations before restocking lakes with fish.—Copyright 1972, Biological Abstracts, Inc. W72-12635

SEDIMENT-INHABITING TESTATE AMOEBAE (RHIZOPODA, TESTACEA) FROM THE FINSTERTALER SEEN (TYROL/AUS-TRIA), (SEDIMENTBEWOHNENDE TRIA),
SCHALENAMOBEN RHIZOPODA, TESTACEA)
DER FINSTERTALER SEEN (TIROL)),
Biological Station, Lunz am See (Austria).
For primary bibliographic entry see Field 05A. W72-12653

GEOCHEMISTRY OF HOLOCENE BEDS OF LAKE MUTNOYE (GEOKHIMIYA GOLOT-SENOYYKH OTLOZHENIY OZ. MUTNOGO), Akademiya Nauk SSSR, Moscow, Institut Geokhimii i Analiticheskoi Khimii. L.F. Gribovskaya, A. S. Kremen', and Ye S.

Malyasova. Geokhimiya, No 8, p 992-1003, August 1971. 2 fig, 4 tab, 19 ref.

Descriptors: *Geochemistry, *Lakes, *Lake beds, *Lake stages, *Recent epoch, Geologic time, Radioactive dating, Dendrochronology, Palynology, Pollen, Spores, Sediments, Sedimentation, Salinity, Salts, Carbonates, Trace elements, Metals, Organic matter, Correlation analysis. Identifiers: *USSR, *Smolensk Oblast, *Biogeochemistry, Silicon, Barium, Vanadium, Sapropel.

Investigations of principal stages in the biogeochemical evolution of Lake Mutnoye in the Smolensk Oblast were based on chemical, spectral, and spore-pollen analyses. The lake area is 13.5 ha and the maximum depth is 3 m near the center. The salt content is 200-250 mg/liter, represented mainly by HCO3, Ca, and Mg. Sedimentation in the lake has been continuous since the Allerod period, the average annual rate at the center being 0.7 mm. The lake has many features in common with Lake Bebrukas in southern Lithuania, but differs from many lakes in Belorus-sia, Poland, and the Baltic Sea area. Carbonate accumulation in Lake Mutnoye began in the Late Drias period and in the other lakes, in the Preboreal period. In the Boreal period, Ca content decreased sharply in Lake Mutnoye sediments but reached a maximum in the other lakes. The con-centration of Si, Ca, Fe, Mn, Cu, Sr, and Pb in Lake Mutnoye sediments varied widely from one period to another, particularly in the case of trace elements. Migration of Fe and Mn was related to the stage of development of the weathering crust. In the Allerod and Late Drias periods, Mn migrated early from the weathering crust in the almigrated early from the weathering crust in the alkaline stage of the eluvial process, while Fe
migrated later during the acid stage of the eluvial
process in the Atlantic period. Vegetation in the
lake basin greatly affects migration of chemical
elements, particularly Cu and Pb. These elements
correlate with the organic matter in lake sediments, while Mn. Cr. Mo. Sr. and Ba correlate
with the inorganic fraction. A correlation is
established between Sr and Ba and between Ba
and Mn. (Josefson-USGS)
W72-12688

THE GRADUAL DESTRUCTION OF SWEDEN'S

LAKES, National Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 05C.

FRESHWATER OSTRACODS (CRUSTACEA) FROM LAKE NIPIGON, ONTARIO, Waterloo Univ. (Ontario). Dept. of Biology. P. M. Nuttall, and C. H. Fernando. Can Field Natur. Vol 85, No 2, p 184-186. 1971. Map.

Identifiers: Canada, *Crustaceans, Fresh water, *Lake Nipigon (Canada), Ontario, Ostracods, Water temperature.

Twelve species of Ostracoda were identified from collections made in Lake Nipigon. This adds 8 new records of Ostracoda for this lake. Morphological records of Ostracoda for this lake. Morphological variation hitherto unrecorded was found in 2 spp. Some species considered as shallow water forms from previous work were recorded from deep water. The distribution of species in the lake appears to be influenced by the temperature of the water. The following 12 spp. were identified: Candona candida (Muller, 1776); C. crogmaniana Turner, 1894; C. elliptica Furtos, 1933; C. eriensis Furtos, 1933; C. ohioensis Furtos, 1933; Candona cf. C. acutula Delorme, 1967; Candona cf. C. acupulosa Furtos, 1933; Cyclocypris laevis (Muller, 1766); C. serena (Koch, 1838); C. lacustris (Sars, 1863); Ilyocypris bradyi (Sars, 1890); Limnocythere friabilis Benson and MacDonald, 1963.—Copyright 1972, Biological Abstracts, Inc. W72-12733

A MODEL FOR THE INTERACTION BETWEEN THE FISH INDUSTRY AND THE ECOLOGIC SYSTEM OF A RESERVOIR, Akademiya Nauk SSR, Moscow. Inst. of Evolutionary Physiology. V. V. Menshutkin.

V. V. Mensnukin. Vopr Ikhtiol. Vol 11, No 2, p 195-202. 1971. Identifiers: °Fish populations, *Aquatic environment, Computers, Ecology, Fish, Interactions, Kamchatka, Model studies, Reservoirs, USSR.

Up to the present time the various models designed to correlate fish populations in various reservoirs with the different biotic and abiotic characteristics of the reservoirs have been essencharacteristics of the reservoirs have been essentially qualitative. In the present study an attempt was made to place such an approach on a quantitative basis taking into consideration not one but several factors affecting fish populations. This approach is significantly different from those previously attempted in that emphasis was placed on cause and effect relationships rather than correlational dependencies. Application of such a theoretical approach to Lake Dal'noe (Kamchatka region) gave promising results in that it seems region) gave promising results in that it seems possible to consider the entire ecological system of a reservoir involved in the fish yield as I system whose variables lead themselves to computer analyses.—Copyright 1972, Biological Abstracts, Inc. W72-12737

PHYTOPLANKTON OF TWO DANISH LAKES, WITH SPECIAL REFERENCE TO SEASONAL CYCLES OF THE NANNOPLANKTON, Copenhagen Univ. (Denmark). Inst. of Plant Anatomy and Cytology. For primary bibliographic entry see Field 05C. W72-12738

THE EFFECTS OF REGULATED VOLGA FLOW ON THE REPRODUCTION OF ASP, BLUE BREAM, WHITE BREAM, AND BLEAK IN THE SVIYAZH BAY OF THE KUBYSHEV

Kazan State Univ. (USSR). V. A. Kuznetsov.

V.A. Kuznetsov.
Vopr Ikhtiol. Vol 11, No 2, p 232-239. 1971. Illus.
Identifiers: *Fish reproduction, Abramis ballerus,
Adaptation, Alburnus alburnus, *Asp, Aspius
aspius, *Bleak, Blicca bjoerkna, *Bream, *Flow,
*Kuibyshev Reservoir, Plants, *Regulated flow,
Reservoirs, Sviyazh Bay, USSR, Volga River.

Construction of the Kuibyshev Reservoir led to significant changes in the hydrology of the middle Volga. In order to determine the effects of the reservoir on fish, the reproduction of several species was studied during a 7 yr period (1963-1969) at the Sviyazh Bay of the reservoir. The species investigated were: ask (Aspius aspius), blue bream (Abramis ballerus), white bream (Blicca bjoerkna), and bleak (Alburnus alburnus). Best adaptability in terms of reproduction was shown by the asp and the bleak who started to deposit their eggs on rocky regions, plants, and submerged roots. In addition, the bleak also began to utilize deep spawning grounds. Thus, the asp and the bleak knetained their population at relatively high levels. The blue bream also adapted fairly well to the new conditions and started to deposit eggs in riverbank regions that were rich in plant life and well protected from winds. However, in periods of low water the eggs died massively and, consequently, numerically the blue bream dropped sharply in Construction of the Kuibyshev Reservoir led to

Group 2H-Lakes

such years. White bream began to deposit eggs close to the banks when the waters began to rise (end of May to beginning of June) and, thereby, showed greater adaptability than the blue bream.—Copyright 1972, Biological Abstracts, Inc. W72-12747

DISTRIBUTION PATTERNS OF FIVE SELECTED GASTROPODS SPECIES FROM MCCARGO LAKE, Kansas State Univ., Manhattan. For primary bibliographic entry see Field 05C.

MIGRATIONS OF ADULT AND JUVENILE WALLEYES (STIZOSTEDION VITREUM VITREUM) IN SOUTHERN LAKE HURON, LAKE ST. CLAIR, LAKE ERIE, AND CON-NECTING WATERS, Wayne State Univ., Detroit, Mich. Dept. of Biolo-

gy. R. G. Ferguson, and A. J. Derksen. J Fish Res Bd Can. Vol 28, No 8, p 1133-1142.

J Pish Res Bd Can. Vol 28, No 8, p 1133-1142. 1971. Illus. Map. Identifiers: *Fish migration, *Great Lakes, Canada, Lake Erie, Lake Huron, Lakes, Lake St-Clair, Stizostedion vitreum vitreum, *Walleye, Thames River, St. Clair River.

Recoveries of S. vitreum vitreum tagged as adults and juveniles at various sites in waters from southern Lake Huron to eastern Lake Erie prowided information on the migrations of the Thames River stock and the mixing of these fish with other stocks in the study area. Walleyes spawning in the Thames River in March and April quickly migrated its the St. Chir Birine. into the St. Clair River and southern Lake Huron, where they mingled with other stocks, including some from Lake Erie. The return migration to the Thames River occurred between Nov. and March. Juvenile walleyes tagged in Lake St. Clair, moved downriver to Lake Erie. Young-of-the-year fish downiver to Lake Erie, Toung-oi-tue-year itsn tagged in western Lake Erie, many presumably of Lake St. Clair origin, provided evidence of a reverse migration, since they tended to move back into Lake St. Clair and Lake Huron as they matured. Adult walleyes tagged along the Canadian shore of Lake Eric migrated eastward during the summer, but were recovered in or near the western basin during the spawning season. Thus, western Lake Eric appeared as a juvenile milling or mixing area during the summer, whereas southern Lake Huron and the north shore of central and eastern Lake Erie were adult areas.— Copyright 1972, Biological Abstracts, Inc. W72-12929

EUTROPHICATION OF SURFACE WATERS--LAKE TAHOE. Lake Tahoe Area Council, South Lake Tahoe,

Calif. For primary bibliographic entry see Field 05C. W72-12955

ROLE OF BACTERIA IN THE NITROGEN

CYCLE IN LAKES,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 05C. W72-12956

EUTROPHICATION OF SURFACE WATERS--LAKE TAHOE INDIAN CREEK RESERVOIR. Lake Tahoe Area Council, South Lake Tahoe, For primary bibliographic entry see Field 05C.

W72-12957

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PROJECT HYPO. Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters; and Environmental Protection Agency, Pairview Park, Ohio. Ohio District Basin Office. For primary bibliographic entry see Field 05C. W72-12990

OBSERVATIONS ON THE NUTRIENT COM-POSITION OF A FRESHWATER LAKE ECOSYSTEM, North Dakota Univ., Grand Forks. Dept. of Biolo-

gy; State Univ. Coll., Plattsburgh, N.Y. Dept. of Biological Sciences; and Arizona State Coll., Flag-staff. Dept. of Biology. For primary bibliographic entry see Field 05C. W72-13002

DISTRIBUTION OF REDUCED INORGANIC COMPOUNDS AND THEIR OXIDATION IN

Ehime Univ., Matsuyama (Japan). For primary bibliographic entry see Field 05C. W72-13012

STUDY OF PRIMARY PRODUCTION IN A FOREST POOL, Institut Royal des Sciences Naturelles de

Belgique, Brussels. S. Yuen-Yong.

Bull Inst R Sci Nat Belg. Vol 47, No 21, p 1-9. 1971. Illus. Map.

Identifiers: Belgium, Forest, *Photosynthesis, *Phytoplankton, Pool, *Primary production,

Studies in a Belgian pool were carried out from the beginning of March 1968 to the end of May 1969. Samples of surface water were taken weekly. Tables of data are given. Production showed a maximum in summer and a less elevated maximum in winter. Minima were observed in spring and autumn. Two methods of measurement were used, which gave approximately the same results. By 'primary production' is meant the quantity of organic matter produced by the phytoplankton by the process of photosynthesis.—Copyright 1972, Biological Abstracts, Inc. W72-13021

THE FLUORINE CONTENT AND FOOD VALUE OF KENYA LAKE FISH, University Coll., Nairobi (Kenya).

H. Bergh, and J. Haug.

East Afr Agric For J. 36 (4): 392-400. Illus. 1971. Identifiers: *Fish products, *Flourine contents, Hazard, Health, *Kenya Lake, Perch, Pig,

Studies were conducted to determine whether or not the F content of fish and fish products from lakes Rudolf, Baringo, Naivasha and Victoria was such as to constitute a hazard to consumers. Seafish from Mombasa were also included in the studv. A small feeding trial was conducted to compare the effects of feeding fish meal and a mixture of meat and blood meal to pigs. Analyses of lake waters showed Lake Rudolf to have the highest F content (10.2 ppm), followed by Baringo (6.0 ppm), with Naivasha, Victoria and coastal waters having very low amounts (2.0, 0.7 and 0.11-0.10, respectively). The level of F in fish flesh was low and that of bones, though higher still, very modest. There was evidence from Nile perch of an increase in F content with increase in size (weight) of fish. The F in fish and fish products from Kenya lakes and coastal waters do not constitute a health hazard to consumers and these products are a useful source of protein for human and animals alike.--Copyright 1972, Biological Abstracts, Inc.

21. Water in Plants

WATER USE EFFICIENCY IN PLANT GROWTH AND AMBIENT CARBON DIOXIDE LEVEL, Texas A and M Univ., College Station. Water Resources Inst. For primary bibliographic entry see Field 03B. W72-12391

ENERGY EXCHANGES BETWEEN A PASTURE AND THE ATMOSPHERE UNDER STEADY AND NON-STEADY-STATE CONDITIONS, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). C. W. Rose, J. E. Begg, G. F. Byrne, J. H. Goncz, and B. W. R. Torssell.

Agricultural Meteorology, Vol 9, No 5/6, p 385-403, March 1972. 5 fig, 2 tab, 15 ref.

Descriptors: *Energy transfer, *Micrometeorology, *Lysimeters, *Convection, *Semiarid climates, *Solar radiation, Latent heat, Clouds, Vegetation effects, Estimating equations, Pastures, Grasses, Agroclimatology.

Because of the fundamental limitation of assuming energy, momentum and gas exchange processes to be steady-state and one dimensional in character, the application of micrometeorological theory to the description of energy and mass exchange between vegetation and the atmosphere has been between vegetation and the attacoparts has creatized to cloud-free periods. This paper attempts to test the validity of applying existing steady-state (SS) micrometeorological theory to analyze measurements under patently non-steady-state (NSS) conditions accompanying the highly variable radiation with intermittent cloud. NSS conditions are characterized by fluctuations in air temperature gradients and vapor pressure gradients and the errors introduced by such conditions cannot be evaluated on theoretical grounds alone. Energy exchange determinations were carried out with a pasture of Townsville stylo (Stylosanthes humilis) at Katherine, Northern Territory, Australia, in a region of dry monsoonal climate. Both latent and sensible heat fluxes were measured at 2 sites and independently obtained by both fluxatron and weighing lysimeter. The latent and sensible heat fluxes were derived from the micrometeorological profiles and integrated over time and compared. There was a modest variation in fluxes between sites which may have been due to inhomogeneities within the experimental area. Also, compared to the lysimeter measurement. micrometeorological techniques underestimate heat flux up to 18% over a day. Further clarifica-tion of this is needed. (Casey-Arizona) W72-12528

TEMPERATURE AND MOISTURE STRESS AF-FECT GERMINATION OF GUTIERREZIA

Forest Service (USDA), Flagstaff, Ariz. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 04A. W72-12533

BIOTIC AND HYDROLOGIC VARIABLES IN PRAIRIE POTHOLES IN NORTH DAKOTA, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 04A. W72-12535

LEHMANN LOVEGRASS ON THE SANTA RITA EXPERIMENTAL RANGE, 1937-1966, Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 04A. W72-12539

SOME WATER MOVEMENT PATTERNS OVER AND THROUGH PINYON-JUNIPER LITTER, Utah State Univ., Logan. Dept. of Range Scienc For primary bibliographic entry see Field 04A. W72-12540

hara (USSR).

R. G. Usmanova.
Vopr Ikhtiol. Vol 11, No 2, p 203-216. 1971.
Identifiers: *Fish physiology, *Aquatic environment, Age, Barbus capito conocephalus, Basins, *Sexual dimorphism, Ecology, Kashkadarya River, Fish populations, Rivers, USSR, Variations, *Turkestan Barbel.

R. G. Usmanova

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One of the most important commercial fishes in Uzbekistan is B. capito conocephalus. However, the morphology and ecology of this species has been studied inadequately and, in addition, what data are available has been derived from fish caught in reservoirs. Consequently these studies were devoted to sexual dimorphism and age- and region-related variations in barbel in the basins of the river Kashkadarya, since it is known that many barbel populations never enter the reservoirs but spend their entire life span in the river. On the basis of 500 specimens that were examined, it was found that sexual dimorphism is clearly present, and it is possible to distinguish between males and females on the basis of 13 statistically significant indices. Age- and territory-related variations were clearly evident in a number of morphologic features in the barbels from Kashkadarya, Tankhazdarya, and Shurabsa rivers and were obviously due to the hydrologic environment and the available nutrients .- Copyright 1972, Biological Abstracts, Inc. W72-12720

EFFECTS OF CLIMATE ON RATE OF BANANA

LEAF PRODUCTION, Tropical Fruit Research Station, Alstonville (Aus-

tralia). D. W. Turner. Trop Agric. Vol 48, No 3, p 283-287. 1971.

Identifiers: "Crop response, Banana M, "Climate, Humidity, Leaves, Monthly, Production, Rates, Regression, Speed, Techniques, Temperature,

Data were analyzed using multiple regression techniques. Mean monthly temperature, wind speed and relative humidity are significantly correlated with rate of leaf production. These variables are closely interrelated and the individual effect of each cannot be properly separated.—Copyright 1972, Biological Abstracts, Inc. W72-12722

ENERGY EXCHANGE WITHIN THE CROP CANOPY OF TOWNSVILLE STYLO, STYLOSANTHES HUMILIS H.B.K., Commonwealth Scientific and Industrial Research Organization, Carberra (Australia). Div. of Land Research and Regional Survey.

J. H. Goncz, and C. W. Rose.

Agricultural Meteorology, Vol. 9, No. 5/6, p. 405-419, March 1972. 7 fig, 2 tab, 12 ref.

Descriptors: *Micrometeorology, *Energy budget, *Canopy, *Pastures, *Data processing, Model studies, On-site data collections, Vertical migration, Temperature, Humidity, Vapor pressure. Identifiers: *Energy exchange, *Transport processes, *Layering.

Meteorological measurements of crop canopy energy-exchange processes are extremely complicated, requiring continuous monitoring of a large number of variables over space and time. The exchange coefficient hypothesis of micrometeorology assumes that the flux of a quantity is proportional to the negative gradient of the concentration of the same quantity. This is valid if sampling is extensive enough to yield a profile which can be considered to be an average picture of canopy microclimate. For 22 days, an intensive micrometeorological study was conducted in a sown pasture of Townsville stylo with the objectives of evaluating the adequacy of 1-dimensional transport process models within the compact canopy, and of carrying out all analyses of rough field data entirely by machine. It appeared that the I-dimensional model could not always explain the data particularly because of anomalies in the vapor pressure profiles which lasted for varying periods of time. These anomalies were characterized by the appearance of a layer in which specific vapor pressure was less than in the layers both above and below. This was explained by a 'tunneling effect' hypothesis concerning canopy ventilation. Traditional data analysis involves data interpolation to obtain continuous profiles and profile differentiation to calculate energy exchange. It is hoped that obtain continuous profiles and profile differentia-tion to calculate energy exchange. It is hoped that methods of continuous machine data processing will be developed to replace this method. (Casey-

EDAPHIC ARIDITY AS A FACTOR IN ANGIOSPERM EVOLUTION, California Univ., Davis. Depts. of Geology; and California Univ., Davis. Dept. of Botany. For primary bibliographic entry see Field 03B. W72-12828

DRINKING PATTERNS AND BEHAVIOR OF AUSTRALIAN DESERT BIRDS IN RELATION TO THEIR ECOLOGY AND ABUNDANCE, Michigan Univ., Ann Arbor. Museum of Zoology; and Western Australia Univ., Nedlands. Dept. of Zoology. C. D. Fisher, E. Lindgren, and W. R. Dawson. Condor, Vol 74, No 2, p 111-136, Summer 1972. 11 fig, 7 tab, 45 ref.

Descriptors: *Ecological distribution, *Birds *Arid lands, *Animal behavior, Biological communities, On-site investigations, Environmental effects, Water supply, Xerophilic animals, Surface waters, Temperature, Solar radiation, Diurnal, *Australia. Identifiers: *Selection pressures (Biological).

Desert conditions exist over almost half of the total land area of the Australian continent. Birds which are primarily diurnal and not fossorial must reconcile the antagonistic demands of evaporative cooling and water balance maintenance. Since the cooling and water balance maintenance. Since the success of many species must be intimately linked with their capacities for locating and utilizing surface waters, field studies were undertaken of the drinking habits of birds at various waterholes in the arid interior of the continent. Over more than 2 years, 20 systematic dawn-to-dusk watches were conducted in each of 10 waterholes. Appendices list 127 species observed and various data on the drinking habits of 118 of them. Although 60% of drinking habits of 118 of them. Atthough 60% of the species studied were independent of surface water supplies, the majority of the individuals in-habiting the regions where water supplies were available were water-dependent species whose distributions were critically dependent on water availability. All these species had characteristic drinking times described to avoidance of high temperatures and intense solar radiation. While granivorous species are the most dependent on water, they are also the most abundant birds in the arid regions because seeds are a dependable food supply and because stock water developments have increased surface water developments have increased surface water supplies. Diurnal avian predators undoubtedly exert strong selection pressures at these waterholes. (Casey-Arizona) W72-12846 TISSUE WATER POTENTIAL, TISSUE WATER PUTENTIAL,
PHOTOSYNTHESIS, C-14-LABELED
PHOTOSYNTHATE UTILIZATION, AND
GROWTH IN THE DESERT SHRUB LARREA
DIVARICATA CAV,
California Univ., Riverside. Dept. of Life For primary bibliographic entry see Field 03B. W72-12851

EFFECT OF SALINITY ON POLLEN I. POLLEN VIABILITY AS ALTERED BY INCREASING OSMOTIC PRESSURE WITH NACL, MAGNESI-UM CHLORIDE, AND CALCIUM CHLORIDE, Kansas Agricultural Experiment Station, Manhat-

P. R. Reddy, and J. A. Goss. American Journal of Botany, Vol. 58, No. 8, p 721-725, August 1971. 5 fig, 14 ref.

Descriptors: *Pollen, *Reproduction, *Saline waters, *Osmotic pressure, *Toxicity, Ions, Magnesium, Sodium, Calcium, Chlorides, Laboratory

Salinity of the growth medium has long been known to reduce plant vegetative growth. Less studied is the effect of salinity on plant reproductive development. The effects of varying concentrations of Ca, Na and Mg chlorides at 0-4 bars osmotic pressure on pollen viability as determined both by germination in vitro and the viability stain test. The plant used was the petunia (Petunia hybrida) because its pollen has been well-studied. Grown in single salt solutions, pollen viability decreased with increasing salinity, and the decrease was greater with NaCl than with Mg or Ca chlorides. In vitro studies showed that NaCl inhibited pollen germination and pollen tube growth more than the other salts. Not only was the Mg salt least injurious, it also promoted tube growth at low levels of osmotic pressure. Low concentrations of least injurious, it also promoted tube growth at low levels of osmotic pressure. Low concentrations of Mg salt added to NaCl reduced the toxic effects of the latter, while Ca salt additions behaved similarly, though less effectively. It would appear that specific or toxic ion effects were more important than osmotic pressure in reducing pollen viability. (Casey-Arizona) W72-12853

EXPERIMENTAL CONTROL OF SOIL WATER CONTENT IN THE VICINITY OF ROOT HAIRS, Washington State Univ., Pullman. Dept. of Agronomy and Soils.

J.J. C. Hsieh, W. H. Gardner, and G. S. Campbell. Soil Science Society of America Proceedings, V. 36, No. 3, p 418-421, May-June 1972. 5 fig. 8 ref.

Descriptors: "Soil water, "Plant growth, "Plant root systems, "Soil-water-plant relationships, "Laboratory equipment, Water balance, Trans-piration, Corn (Field), Leaves, Soil water movement, Root distribution.

Identifiers: *Soil matric potential, *Plant water status, *Root hairs, *Soil water availability.

Information is needed concerning soil water con-tent in the close vicinity of absorbing roots. A technique was developed for maintaining a predetermined soil water content around root hairs. It consists of growing plants on a fine screen placed over the soil in such a way that only root hairs can extend through the screen into the soil beneath. Essentially the screen serves as a perhapital device for spraying cort bairs in a thin mechanical device for growing root hairs in a thin lamina of soil. Water content in the root hair zone was non-destructively measured by gamma-ray at-tenuation. Soil water content could be adjusted to tenuation. Soil water content could be adjusted to transpiration losses to within 0.015 cu cm water per cu cm soil. Plant growth in the presence of the root hair screen seemed normal. At soil matric potentials lower than -11 bars, corn growth was reduced and later ceased at lower potentials. The matric potential just outside the root hair zone was only about 1/2 as low as that inside the zone, showing that average water conditions in a soil

Group 21-Water in Plants

volume can be appreciably different from the water conditions existing near the root hairs. Extrapolation of these results to field conditions would not be fully justified until future technical improvements are made. (Casey-Arizona) W72-12855

EFFECT OF CONSTANT SALINITY LEVELS ON WATER-USE EFFICIENCY OF BEAN AND COTTON, Agricultural Research Service, Riverside, Calif.

Agricultural Research Service, Riverside, Cali Salinity Lab. For primary bibliographic entry see Field 03C. W72-12856

CALORIE-TO-PROTEIN RATIO FOR BROOK TROUT (SALVELINUS FONTINALIS), New Hampshire Univ., Durham. Dept. of Animal

New Hampshire Univ., Durham. Dept. of Anima Science. R. C. Ringrose.

J Fish Res Bd Can. Vol 28, No 8, p 1113-1117.

Identifiers: *Brook trout, *Fish diets, Calories, Proteins, Ratios, Salvelinus fontinalis.

Based upon a kg of feed, the results suggested that S. fontinalis required approximately 75 kcal of metabolizable energy for each 1% of protein in the feed. Additional feed energy, resulting in greater calorie-to-protein ratios, reduced weight gained but did not significantly increase fat content of the dry carcass. The carbohydrate and protein of wheat middlings were utilized by the trout. A toasted cereal product composed of 80% corn and 20% wheat was metabolized for energy. Delactosed dried whey was found less effective than glucose as an energy source for trout.—Copyright 1972, Biological Abstracts, Inc. W72.1/288

EFFECT OF OSMOTIC SOLUTIONS ON THE GERMINATION OF PEPPER (CAPSICUM ANNUUM) AT SUB-OPTIMUM TEMPERATURES, Delaware Univ., Newark. Dept. of Plant Science. J. C. Ryder, Jr.

Ph D Thesis, June 1970. 73 p, 11 fig, 21 tab, 70 ref. OWRR A-010-DEL (4).

Descriptors: *Seed treatment, *Soaking, *Saline water, *Germination, Testing, Temperature, Aqueous solutions, Osmotic pressure, Snalytical techniques, Seeds, Growth rates, Agriculture. Identifiers: *Pepper seeds (Capsicum Annuum), Physiological effects, Plants.

Tests were made to determine if soaking pepper seeds in salt solutions would stimulate germination under low temperatures and to determine physiological effects of the soaking on the pepper seeds. Soaking pepper seeds in aerated solutions with an osmotic pressure of approximately 13.5 atmospheres for a period of 7 days was effective in increasing the germination rate of the seeds under sub-optimum germination conditions. The nature of the osmotic solution was not a factor in the effectiveness of the soak; however, the osmotic pressure of the soaking solution had a direct bearing on the effectiveness of the soak and also on the respiration rate of the seeds during the soak. The effectiveness of the soak was increased by both daily changing or filtering of the soaking solution. Also, the seed treatment was most effective under sub-optimum germinations. Treated seeds were stored up to 5 months without any reduction in the effectiveness of the soak.

CONTENTS OF WATER, ORGANIC MATTER AND ASH ELEMENTS IN NEEDLES OF DIF-FERENT AGE IN PICEA ABIES, V. V. Smirnov, and V. G. Semenova.

Lesovedenie. 5. p 57-67. 1969. English summary.

Identifiers: *Plant physiology, Age, Ash, *Needles, Organic matter, Picea abies G, Spruce G, Moisture content.

Fourteen sample spruce trees of various thicknesses were cut in an 85-yr-old large-fern spruce forest (Moscow area). One branch was taken from the middle part of the crown of each tree, in order to count the distribution of needles according to age. Greatest water content was observed in 1-yr-old needles; with increasing age of needles and diameter of the tree, the water content of the needles diminished. The weight of 1000 needles and the total absolute dry weight of needles of the individual age groups were related with weather conditions and the yield of cones and seeds of the preceding year. The ash content of the needles depended mainly on their age and, occasionally, on the size of the tree. The concentration of Si, Ca, Fe, Mn, and, partially, of Al increased with the increasing age of the needles but the content of P and K decreased. For the stand as a whole, the needle contents of minerals/ha were: Ca 157.35 kg, K 93.53, Si 65.65, Mg 36.82, Al 29.57, P. 23.30, Mn 21.72 and Fe 1.14 kg.—Copyright 1972, Biological Abstracts, Inc. W272-12886

THE DISTRIBUTION OF JUGLANS REGIA IN AZERBAIDZHAN, A. I. Kuliev.

Tr Azerb Nauchno-Issled Inst Lesn Khoz Agrolesomelior. 8: p 63-70. 1968. Identifiers: Azerbaidzhan, *Distribution, *Juglans regiz D, Soils, USSR, Moisture availability.

J. regia was found wild in the forests of the Greater and Lesser Caucasus and in the Talysh. This tree was widespread in the Tertiary; because of exploitation and felling, only individual clumps and groves with a density of 0.7-0.5 were preserved in the gorges and river valleys which have sufficient moisture. Persian walnut attains a height of 35 m and belongs to site class I. Most of the walnut plantations are concentrated in the Sheki-Zakataly zone on the southern slope of the Greater Caucasus at an altitude of 500-1100 m. Individual trees are found at 2000 m. Walnut grows successfully in the Kuba-Khacmas zone and in the Caspian lowland.—Copyright 1972, Biological Abstracts, Inc.
W72-12887

SOME MORPHOLOGICAL-ANATOMICAL FEATURES OF PERENNIAL GRASSES GROWN ON SLUDGE TAILINGS OF THE URAL ALU-MINIUM FACTORY.

MINUM FACTORY,
M. A. Polovova, and I. I. Shilova.
Uch Zap Ural Univ. 94. p 161-173. 1970.
Identifiers: *Industrial wastes, *Crop response,
Aluminum, Factory, Grasses M, Leaves,
Morphology, Nutrients, Perennial,
Tailings, Ural, Wheat, Xeromorphism.

The morphological and anatomical structure of perennial grasses grown on tailings with different substrates (sludge + soil, sludge + mud) were compared with plants of the same species grown on soil. Two plants were studied: awnless brome grass and a 'rhizomeless' wheat-grass 4 yr old. The following changes were noted: decreased height, decreased bushiness and decreased number, length, and width of leaves (and thus also a reduction in assimilation surface); a reduction in the number, length, and thickness of the roots; a reduction in the length of the inflorescences, number of nodes, spikes, flowers, and fruit in the inflorescence. Also noted were intensified xeromorphism as manifested in an increase in the total length of the veins per unit of leaf surface, more cells in the epidermis and stomata with a decrease in their size, and greater development of rows of assimilation cells with a simultaneous decrease in their size, and greater development of mechanical and conductive tissue in all the organs studied. These changes are caused principally by a

shortage of nutrients (especially N), the physiological dryness of the substrate owing to its salt content, and the toxic action of A1, Fe, N salts.--Copyright 1972, Biological Abstracts, Inc. W72-12896

THE ROLE OF INFUSORIA IN THE NUTRITION OF THE LARVA OF HERBIVOROUS FISHES,

G. S. Kornienko.
Vopr Ikhtiol. Vol 11, No 2: p 303-310. 1971.
Identifiers: *Fish diets, *Carps, Fishes, Herbivores, Infusoria, Larvae, Nutritient requirements. Plankton.

Nutrition of grass carp, golden carp, and silver carp larvae were studied during June-July 1968 and 1969 in the Krasnodar and Rostov regions. The resultant data showed that during their larval period these fishes subsist on infusoria, and that the highest intake is shown by the larva of the grass carp during the II and III stage of their development. The larvae of the silver carp evidenced the lowest consumption of infusoria. Consumption of the infusoria falls sharply when the fish go over to a diet of macrophytes and zooplankton.—Copyright 1972, Biological Abstracts, Inc.
W72-12908

PLANT COMMUNITIES IN THE UPPER REGION OF THE WIEPRZ RIVER WITH PARTICULAR ATTENTION OF MEADOW COMMUNITIES (EASTERN POLAND), Medical Academy, Lublin (Poland).

M. Izdebska.
Fragmenta Florist Geobot (Krakow). Vol 15, No 3,
p 283-332. 1969. Illus. Maps. English summary.
Identifiers: *Plant populations, Grasslands, Alnus
D, Calluna D, Carex M, Juncus M, Litorella D,
Nardus stricta M, Phragmites M, Plants, Poland,
Scheuchzeria M, Soils, *Wieprz River.

On the basis of characteristic species, 29 associa-tions and 4 plant communities within 7 classes were distinguished. In the geobotanic arrangement the meadow associations upper Wieprz river valley Litorelletea and Potametea, 5 associations of the classes Litorelletea and Potametea were distinguished. These associations cover small surfaces of the Wieprz river, fish ponds, ditches, turf pits and oxbow lakes. Reservoirs are filled with shallow, mainly eutrophic, flowing or stagnant water. The scantiness of species is a common feature of the aquatic associations. Within the class Phragmitetea were distinguished 3 alliances with 11 associations. The associations occur on waterlogged ground with a considerable periodic oscillation of groundwater. Periodic stagnation of water between the hills favors plants of the class Scheuchzerio-Caricetea fuscae. In the valley of the upper Wieprz river have developed 3 associations of the class Alnetea glutinosae. All 3 associations occur on bog soils of various thickness formed of alder wood peats. The mosaic of plants is due to the hill-depression conditions. Within the Scheuchzerio-Caricetea fuscae class are distinguished 3 orders with 5 associations. In the meadows they are favored by moist, poorly aerated and strongly acidic soil. Within the Molinio-Arrhenatheretea class are distinguished 4 associations and 3 communities. Over a large area of meadows in the Wieprz valley they are atta to small, local hills, which are rarely flooded; peaty-mineral and mineral soils predominate. The Nardo-Callunetea class is represented by the Nardo-Juncetum association and a community of Nardus stricta.--Copyright 1972, Biological Abstracts, Inc. W72-12927

VARIATION IN LEAF CHARACTERISTICS AMONG PROVENANCES OF EUCALYPTUS

CAMALDULENSIS DEHN. GROWN IN ZAM-BIA, Oxford Univ. (England). Commonwealth Forestry

Inst.
J. Burley, P. J. Wood, and A. S. Hans.
Aust J Bot. Vol 19, No 2, p 237-249. 1971. Illus.
Identifiers: Plant physiology, *Leaves, Angle,
Base, Components, Density, Ecotypes, *Eucalyptus camaldulensis D, Glands, Latitude, Length,
Oil, Provenances, Temperature, Width, *Zambia.

Eight morphological characters of leaves were examined in 2-yr-old trees of 25 provenances of E. camaldulensis Dehn. grown in a replicated trial in Zambia. Provenances differed significantly in leaf length and width, base angle, and oil gland density but significant effects were attributed to trees within provenances. Leaf curvature also varied between provenances, trees, and branches. The tip angle and the number of veins did not vary significantly. Leaf length and oil gland density were related to maximum temperature at seed source rather than to latitude but the reverse occurred for leaf width. Significant amounts of variation were explained by a linear combination of temperature d latitude but not by longitude, altitude, or rainfall. Information on 7 traits was combined in principal component analysis in which the first com-ponent (a measure of leaf shape) accounted for 36% of total observed variation while the second (weighted largely on leaf length) accounted for 26%. Mapping of both univariate and multivariate results indicated that there are 2 major ecotypes and gave some evidence of clinal and ecotypic variation within them. The conclusions support those of other workers both in natural populations in Australia and in exotic populations elsewhere.--Copyright 1972, Biological Abstracts, Inc. W72-13004

OAK REGENERATION IN THE UPPER CAR-MEL VALLEY, CALIFORNIA, California Univ., Carmel Valley. Hastings Natural

History Reservation. J. R. Griffin.

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Ecology. Vol 52, No 5, p 862-868. 1971. Illus. Identifiers: *Reforestation, *Oak trees, Birds, *California, *Carmel Valley (Calif), Competition, Deer, Drought, Gophers, Grass M, Quercus agrifolia D, Quercus douglasii D, Quercus lobata D, Slopes, Squirrels, Temperature.

Acorn germination and seedling survival were stu-died in 3 species of foot-hill woodland oaks. Quercus douglasii and Q. lobata acorns matured in Oct. These non-dormant acorns germinated quickly at favorable temperatures. Q. agrifolia acorns matured later and germinated more slowly. Acorns placed on the surface of a south-aspect plot lost viability. On a north-facing plot they survived au-tumn heat and germinated during the winter, but rooted poorly. Acorns buried on either aspect germinated well. Burial by birds and squirrels, important in regeneration, insulates acorns from autumn heat, partially hides them from animals, and ensures good rooting. Q. douglasii seedlings had the greatest drought tolerance. In grass cover on a south-facing soil even they can survive their first summer only during wet years. On north aspects seedlings of several species can survive grass competition over a broader range of climatic conditions. Deer and pocket gophers are important in eliminating seedlings that survive the summer drought.--Copyright 1972, Biological Abstracts, W72-13008

PRINCIPAL LIMNOLOGIC TRAITS OF NORTHERN ARGENTINA, Instituto Nacional de Limnologia, Santo Tome

A. A. Bonetto. Bol Soc Argent Bot. Vol 11 (Suppl.) p 184-209. 1970. Illus. Map. Identifiers: *Argentina, Azolla caroliniana, Azolla filiculoides, Eichornia crassipes M, Fish, *Lim-nology, Plankton, Salvinia herzogii, Salvinia rotundifolia, Shad.

The Parana, Paraguay and Uruguay rivers, their various tributaries and the numerous lakes, pools and marshes associated with them establish the fundamental features of the limnology of northeastern Argentina. The area also includes the basin of the Plata river which, though occupying only 30% of the national territory, comprises 80% of the country's surface water resources. The Paraguay and middle and lower Parana rivers have almost total biological uniformity. The Parana has rather turbid waters. The Berenio river presents an rather turbid waters. The Berenjo river presents an rather turbid waters. The Berenjo niver presents an annual biologic cycle, shown in graphs. The optical climate of the waters depends mainly on the supply of flood waters. An important factor is the presence of floating masses of water plants, such as Eichhornia crassipes, Salvinia herzogii, S. rotundifolia, Azolla caroliniana and A. filiculoides. The phytoplankton, dissolved O2, periplankton, zooplankton and bentos and the principal species of fish are discussed. The shad is the principal species (61.70%).—Copyright 1972, Biological Abstracts, Inc. W72-13013

THE ECOLOGY OF THE CHACO,

Instituto Nacional de Tecnologia Agropecuaria, Colonia Benitez (Argentina). Estacion Experimental Agropecuaria. Jorge H. Morello.

Bol Soc Argent Bot. Vol 11, (Suppl.), p 161-174. 1970

Identifiers: Argentina, *Chaco (Argentina), *Ecology, Lichens, Polybetes, Psocoptera, Soils, Vegetation.

The Argentine Chaco is an expanse 1/2 million km2 in area, which can be classified into 3 levels graded by density of vegetation as photographed from the air. The geomorphology comprises several types: narrow river valleys averaging 250 m in width, a system of slowly draining prehisotric valleys lying at right angles to extinct rivers which have not left an imprint of their old network of waterways, and finally the remaining space of higher ground. Models of vegetation are classified as pastures and savannahs, active or abandoned cultivated areas. Soils are differentiated into forest soils, pasture and savannah soils, and cultivated soils. In the dense forests of red quebrachos, herbivorous animals outnumber the carnivores. Among the species that live on plant life 90% are sap suckers and only 10% leaf eaters. In the shrub stratum the herbivore: carnivore fauna changes. There is an abundance of bark dwelling (corticolous) spiders of the Polybetes genus and many Psocoptera that eat lichens, and pseudoscorpions that eat Psocoptera.-Copyright 1972, Biological Abstracts, Inc. W72-13016

EFFECT OF PRINCIPAL SHELTERWOOD FELLINGS AND OF TENDING FELLINGS ON THE WATER-NUTRITIONAL REGIME OF THE WATE SOILS, M. V. Vaichis.

Tr Litov Nauchno-Issled Inst Lesn Khoz, (1970) 12: p 205-228.

12: P 203-220. Identifiers: *Alnus-Incana-D, *Aspen-D, *Birch-D, Fellings, *Nutritional regime, Oxalis-Acetosel-la-D, Shelterwood, Soils, Spruce-G, Thermal, Vaccinium-Myrtillus-D.

Studies were carried out in aspen, birch and Alnus incana stands of the Birzai dense virgin forest (Lithuanian SSR), on the following aspects: characteristics of the hydrothermal regime; the chemical composition of the precipitation penetrating through the crowns of various tree species; the annual amount and ash composition of litter; the ash composition of leaves and roots; the effect of shelterwood fellings and tending fellings on the biological activity of soils; the nutritional regime of soils according to composition of hydrolyzable N, available P and K forms. The upper horizons of soils of the Oxalis acetosella-Vaccinium myrtillus and V. myrtillus aspen forest types were more acidic than those of the forb type of birch and Alnus incana forests. The amount of available nutrients/tree of the first story in thinned-out stands was 2-4 times higher than in the control. Dominance of spruce results in a delayed biological cycle of nutrients, a low content of bases and an oxidizing effect of the precipitation penetrating through the crowns.—Copyright 1972, Biological Abstracts, Inc. W72-13019

RESPONSE OF SOME PLANT AND ANIMAL SPECIES TO PHYSICAL STRESS IN THE TROPICAL ENVIRONMENT, eopoldo B. Uichanco.

Philipp J. Sci. 98 (2): 155-168. Illus. 1969 (1971). Identifiers: Adiantum-P, Alocasia-M, Animal, Animals, *Drought, Environmental effects, Epidendrum-M-Spp, Plants, Poinsettia-D, Species, Stress, *Tropics, Vanda-Agnes-Joaquim-M.

Even where irrigation water was available, the 1968-1969 extreme drought, which was said to have been the worst in 100 yr, resulted either in the death of susceptible plants, or in some degree of sterility for the duration of the physical stress. These phenomena are apparently similar to, if not falling under the same category as the reaction of certain plant species when transferred to a warmer location than that to which they had been conditioned. Such responses to environmental factors are compared with those of various plant and animal species. Animals and plants from the temperate zone usually degenerate in the tropics. Animals, which survive the shock from the cha in environment, breed; plants seem to follow no consistent trend, although a good many of the perennial species become sterile in the tropics, except at high mountain elevations, which enjoy a subtemperate climate, or in the higher tropic latitudes, as, for instance, near the tropic of Cancer. There are certain plant species, particularly among the annuals, which are resilient enough to be at home in either climate. Within the tropics itself, a small difference in the prevailing temperature maxima between 2 localities has led to sex-repression in various perennial plant spe-cies when these are moved from a relatively cooler to a somewhat warmer site. Akin probably to this phenomenon was the extraordinary delay in flowering observed in Vanda Agnes Joaquim, Epidendrum spp., and poinsettia in 1969. The un-commonly high temperature maxima registered during the 100-yr-record drought obviously provoked in these plants a condition of temporary sterility.—Copyright 1972, Biological Abstracts, Inc. W72-13022

INVESTIGATION OF SCALE PATTERNS AS A MEANS OF IDENTIFYING RACES OF SPRING CHINOOK SALMON IN THE COLUMBIA RIVER, Oregon Fish Commission, Clackamas.

Oregon Fish Commission, Lackamas.

B. R. Bohn, and H. E. Jensen.

Research Report, Fish Commission of Oreg. 3: p
28-36. 1971. Illus. Maps.
Identifiers: "Chinook salmon, Columbia River,
Oncorhynchus-Tshawytscha, "Races, "Salmon,

An attempt was made to identify races of spring chinook, Oncorhynchus tshawytscha (Walbaum), from scale samples collected from adult fish in major tributaries of the Columbia River system during 1966. The following characteristics were compared: number of circuli to the first annulus, number of circuli to the end of freshwater growth, and mean distances between circuli. Tributary

Group 21-Water in Plants

streams were grouped into 4 geographic areas: lower Columbia River, middle Columbia River, upper Columbia River, and Snake River. It was concluded that races could not be separated by the methods used. Although counts differed somewhat, the distinction between groups was insufficient for practical separation. Counts to the first annulus did provide a means of identifying wild and hatchery fish in the Willamette River. Ex-amination of scales from known wild and hatchery fish indicated that an error of about 20% would result when 16 or less circuli were used to identify wild fish and 17 or more to identify hatchery stocks.--Copyright 1972, Biological Abstracts, Inc.

GROWTH OF JUVENILE SPRING CHINOOK SALMON IN LOOKINGGLASS CREEK, Oregon Fish Commission, Clackamas.

W. A. Burck.

Research Report Fish Commission of Oregon, 3: p 37-43. 1971. Illus. Map.

Identifiers: *Chinook salmon, Growth, *Juveniles, *Lookingglass Creek, (Ore), Oncorhynchus-Tshawytscha, *Oregon, Salmon.

Growth of juvenile spring chinook salmon (Oncor-hynchus tshawytscha Walbaum) was studied in Lookingglass Creek during 1964-68. Mean lengths of fish sampled increased from about 35 mm in March to over 80 mm in Oct. Growth was rapid and relatively uniform from April to Sept. and averaged between 7.2 and 9.6 mm/mo. Condition factor was near 0.8 in April and ranged between 1.0 and 1.1 in most samples collected from June through Nov. Condition factor increased with fish length. The length-weight regression equation calculated from the sample data is log W = -5.44454 + 3.25386 log L. Fish reared in separate areas of the stream showed some differences in linear growth which may be a reflection of differences in water temperature in these areas.—Copyright 1972, Biological Abstracts, Inc. W72-13027

CONTACT BETWEEN THE PSEUDOSTEPPE WITH TAMARIX AND THAT WITH ZILLA MACROPTERA IN THE REGION OF BENI-

-ABBES, (IN FRENCH), Caen Univ. (France). Laboratoire de Physiologie Vegetale.

For primary bibliographic entry see Field 03B. W72-13030

LEECHES FOUND ON TWO SPECIES OF HELISOMA FROM FLEMING'S CREEK, MICHIGAN.

Eastern Michigan Univ., Ypsilanti. Dept. of Biolo-

H. H. Sarah Ohio J Sci. Vol 71, No 1, p 15-20. 1971. Identifiers: *Fleming's Creek (Mich), Glos-

siphonia-Complanata, Helisoma-Anceps, Helisoma-Trivolvis, Helobdella-Lineata, Helob-della-Papillata, *Leeches, *Michigan.

A survey of leeches in 3 genera of gastropods collected from Fleming's Creek, near Ypsilanti, Michigan, revealed a selective association between the smaller leech Helobdella papillata and the smaller snail, Helisoma anceps, and between the larger leech Helobdella lineata and the larger snail Helisoma trivolvis. In addition, a few individuals of the leech Glossiphonia complanata were found on both helisomid snails, and this species, together with 9 other species of leeches, was also found either free-swimming or attached to substrate other than one of these snails.--Copyright 1972, Biological Abstracts, Inc. W72-13031 THE RESULTS OF SETTLING PHYTOPHAGIC FISH IN NATURAL WATERS IN KRASNODAR KRAI, (IN RUSSIAN), Y. M. Motenkov.

Sb Nauchno-Tekh Inf Krasnodar Fil Vses Nauchno-Issled Inst Prud Rybn Khoz. 1. p 59-61.

Identifiers: *Bighead, *Carp, Fish, *Grass carp, Krai, Krasnodar, Natural, *Phytophagic fish, Rice-M, Settling, *Silver carp, USSR.

Two-year-old grass carp, silver carp, and bighead were established in Krasnodar Krai natural waters in 1960. In 1962 the young of the silver carp appeared for the first time. Spawning occurred intermittently in the Kuban River in June and July in areas with stony bottoms between Tiflis Station and the Armavir River at depths of 1.5-2.7 m, a current of 1.3-2.15 m/sec and a temperature of 20.8-22.2 deg. C in turbid water. When the young were 4-5 days old they approached the bank and got into the intake of the irrigation systems. After 60-80 days in rice paddies the young reached a weight of 100-140 g; in 1967 there were about 1.8 million silver carp, 1.2 million bigheads, and about 0.3 million grass carp.—Copyright 1972, Biological Abstracts, Inc. W72-13037

2J. Erosion and Sedimentation

EFFECT OF SPECTRAL COMPOSITION ON PHOTOSYNTHESIS IN TURBID RESERVOIRS—PHOTOSYNTHETIC PRODUCTION IN A TURBID RESERVOIR II. DETAILS OF AN INCUBATION MODEL AND COMMENTS ON THE EFFECT OF LIGHT QUALITY ON PHOTOSYNTHESIS,

Kansas Water Resources Research Inst., Manhat-

For primary bibliographic entry see Field 05C.

SEDIMENT TRANSPORT AND DEPOSITION, WALNUT AND PACHECO CREEKS, CONTRA COSTA COUNTY, CALIFORNIA, AUGUST 1965-APRIL 1970,

Geological Survey, Menlo Park, Calif. G. Porterfield.

Geological Survey Open-file Report, 1972. 21 p, 6 fig, 6 tab, 8 ref.

Descriptors: *Sediment transport, *Deposition (Sediments), *Streamflow, *Small watersheds, *California, Flow rates, Sedimentation rates, Sediment discharge, Sediment load, Particle size, Sands, Clays, Silts, Reviews, Hydrologic data. Identifiers: *Contra Costa County (Calif), Walnut Creek, Pacheco Creek.

A summary of the sediment transported by Walnut Creek at Concord, California, and Pacheco Creek near mouth, and the sediment deposited near the mouth during several periods, August 1965-April 1970, is tabulated. Sediment size classes—sand, silt, and clay—are included. Peak discharges, which transport most sediment, occurred frequently during the 1966-70 water years. A mean dealty discharge equal to or more than 1100 for several transport. daily discharge equal to or more than 1,100 cfs occurred 2 days in 1967, 1 day in 1969, and 3 days in 1970. The 1970 water year was the second water year since 1958 that a discharge equal to or more than 1,100 cfs occurred on 3 days. Streamflow during 1966-70 water years was 1.3 times the esti-mated long-term mean during 1909-62. Suspendedsediment discharge during 1966-70 was 1.3 and suspended sand 1.4 times that of the long-term mean. Average streamflow of Walnut Creek ranged from 12,000 to 46,000 acre-feet per year; suspended-sediment discharge ranged from 8,500 to 233,000 tons per year; and suspended-sand discharge ranged from 650 to 74,000 tons per year. (Woodard-USGS)

ON THE BEDDING IN THE NATURAL-LEVEE AND THE POINT-BAR DEPOSITS OF THE GOMTI RIVER, UTTAR PRADESH, INDIA, Lucknow Univ. (India). Dept. of Geology. I. B. Singh.

Sedimentary Geology, Vol 7, No 4, p 309-317, May 1972. 7 fig, 10 ref.

Descriptors: *Sedimentary structures, *Bedding, *Ripple marks, *Alluvial channels, Meanders, Sand waves, Sedimentation, Sediment transport, Alluvium, Bed loads, Suspended load. Identifiers: Natural levees, Point bars, Cross-bedding, *Gonti River (India).

Channel-fill cross-bedding and ripple-bedding units in the natural-levee and the point-bar deposits of the Gomti River, India, are discussed. Channel-fill cross-bedding is produced because of development of and deposition in channels cut across natural levees. Occasionally small-ripple bedding occurs, intricately interlayered with horizontal bedded units of upper-flow regime origin. Some of the horizontal bedding near the top of the point bars and levee is probably produced by settling of suspension clouds under low-energy conditions as a result of decrease in turbulence with receding water. (Knapp-USGS)

A PLEISTOCENE SUSQUEHANNA RIVER CHANNEL CONNECTS THE LOWER REACHES OF THE CHESTER, MILES, AND CHOPTANK ESTUARIES, Johns Hopkins Univ., Baltimore, Md. Chesapeake

Bay Inst.

For primary bibliographic entry see Field 02L. W72-12428

SEDIMENT TRANSPORT CAUSED BY WAVE MOVEMENT (TRANSPORT NANOSOV VOL-

Zakavkazskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR). For primary bibliographic entry see Field 02E. W72-12435

RELATION BETWEEN BOTTOM-SEDIMENT AND SUSPENDED-SEDIMENT DISCHARGES (NEKOTORYYE SOOBRAZHENIYA O SOOT-NOSHENII MEZHDU RASKHODAMI VLEKO-MYKH I VZVESHENNYKH NANOSOV), Zakavkazskii Nauchno-Issledovatelskii

For primary bibliographic entry see Field 02E.

WYSTERM STREET ST

INFILTRATION AND EROSION STUDIES ON PINYON-JUNIPER CONVERSION SITES IN SOUTHERN UTAH,

Utah State Univ., Logan. Dept. of Range Science. For primary bibliographic entry see Field 04D. W72-12531

WHISTLING BEACHES AND SEABED SAND TRANSPORT,
London Univ. (England). Dept. of Pharmaceutics.

K. Ridgway, and J. B. Scotton. Nature, Vol 238, No 5361, p 212-213, July 28, 1972.

Descriptors: *Beaches, *Sands, *Particle shape, *Sediment sorting, *Sediment transport, Sedimentology, Particle size. Identifiers: Whistling sands.

Experiments on the whistling sand of Porth Oer, Caernarvonshire, show that the property of whistling or squeaking, when kicked, scuffed or walked on, arises from the very narrow particle size distribution, combined with fairly spherical particle shape. These two factors enable the sand to yield in shear along thin slip planes, instead of

throughout its bulk, and the drag of uniform particles over one another results in an audible note of regular pitch. There is a tendency for the dilation caused by one particle riding up and over its neighbor to be communicated along the shear plane, so that all the particles at the plane move in unison. A close correlation exists between the occurrence of whistling sand and the position of the landward end of bed-load springs in the sand of the continental shelf. Certain lines are, in effect, watersheds for the flow of sand over the seabed, sand flowing away on each side roughly at 90 deg to the watershed line. These lines are called bed-load partings. Sea conditions along bed-load parting lines are favorable to the rounding of sand grains, perhaps because they are locations where sand residence times are very long. Provided that a suitable site is available for the sand to reach a stable beach, a whistling location will occur at the landward end of the sand reservoir on the seabed. (Knapp-USGS) throughout its bulk, and the drag of uniform parti-

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SUBMARINE CANYONS, Scripps Inst of Oceanography, La Jolla, Calif. F. P. Shepard. Earth-Science Reviews, Vol 8, No 1, p 1-12, May 1972, 7 fig. 19 ref.

Descriptors: *Submarine canyons, *Reviews, *Marine geology, *Turbidity currents, Erosion, Sediment transport, Topography, Geomorpholo-

The nature and origin of submarine canyons, both The nature and origin of submarine canyons, both the deep canyons crossing the continental slope and their shallower continuation seaward as fan-valleys, are discussed. The sea-floor canyons include some of the most rugged features on the face of the earth. Great Bahama Canyon, where it cuts the sea floor between Eleuthera and Great Abaco Island in the Bahamas, reaches a depth of 4,300 m. The canyons are mostly winding V-shaped gorges that extend all the way down to the continental slopes, so that many even reach the great depths slopes, so that many even reach the great depths of the deep ocean floor. The canyon walls include remarkable steep cliffs. The canyons off southern France have vertical and overhanging walls, which are also found in the canyons that flank the southern end of Baja California. The relation of the submarine canyon heads to the adjacent land is significant in that the majority are found off river valleys. Evidence of sediment movement along the canyon axes has been found wherever sediments have been collected. The freshness of the exposed rock on the lower walls of canyons shows that they are being carved at the present time. In addition to erosion by turbidity currents, mass wasting may play an important part in excavating or in maintaining submarine canyons. Under the ocean we may have a combination of downcutting of the canyon axis and upbuilding of the canyon walls. This possibility appears especially good as an in-terpretation for the extremely high walls of Great Bahama Canyon. The Bahama Banks have been growing upward as the entire platform sank. (K-napp-USGS) W72-12700

SOME CURRENT TRENDS IN GEOMORPHOLOGY, Wisconsin Univ., Madison. Dept. of Geography and Geology. G.H. Dury.

1972, 341 ref.

Descriptors: *Geomorphology, *Reviews, Data processing, Model studies, Mathematical models, Computers, Topography, Drainage patterns (Geologic), Hortons Law, Climatology, Paleoclimatology.

In common with other earth sciences, geomorphology made rapid progress during the

1960's, greatly altering its techniques, concepts, and aims. The most important change was adoption of quantitative methods, especially of those depending on data processing by computer. Researching on stream channels, orginating mainly with the U.S. Geological Survey, was extended into the investigation of minimum variance and into the establishment of thermodynamic analogs for fluvial behavior. Increasingly, the application of stochastic methods has come to emphasize the significance of random variation. Climatic geomorphology, the documentation of which is very bulky, is currently under strong challenge from some quarters, but finds powerful support in field records. Slope research, long a central concern of geomorphic work, has taken a new turn with the establishment of the Virgil Network, which is centrally involved with the speed of operation of contemporary geomorphic processes which is centrally involved with the speed of operation of contemporary geomorphic processes in general. Applied environmental work, the extended use of remote sensing techniques, and theoretical abstraction in the form of model-building can be expected to continue their development. (Knapp-USGS) W72-12701

TURBIDITY AND SUSPENDED-SEDIMENT TRANSPORT IN THE RUSSIAN RIVER BASIN, CALIFORNIA, Geological Survey, Menlo Park, Calif. J. R. Ritter, and W. M. Brown, III. Geological Survey Open-file Report, October 1, 1971. 100 p, 38 fig, 10 tab, 28 ref.

Descriptors: *Sediment transport, *Turbidity, *Erosion, *Surface water, *California, Streamflow, Colloids, Suspension, Data collections, Sampling, Streams, Lakes, Sport fish, Aquatic environment, Environmental effects, Land use, Ruroff Water reportation noff, Water properties. Identifiers: *Russian River basin (Calif).

The Russian River in north coastal California has persistent turbidity, which reportedly has caused a decline in sport fish catches. As a consequence, the number of sports fishermen angling in the river has declined, and industries dependent on their business have suffered. To determine the source of the turbidity and the rate of sediment transport in the basin, a network of sampling stations was established in February 1964. This investigation from 1964 to 1968 found that rainstorms and consequent erosion were the primary causes of turbid water. The most persistently turbid water was the water flowing through the East Fork. This was at-tributed chiefly to the diversion of turbid water from the Eel River through the Potter Valley powerhouse tailrace, which did not permit the East Fork to become clear between rainstorms. The area of highest sediment yield was the Dry Creek basin; much of its yield was attributed to land use. In general, sediment yield increased downstream. The measurements of turbidity and concentration of suspended sediment correlated well at most stations although the correlation at individual stations was different and the correlation varied slightly from year to year. (Woodard-USGS) W72-12704

A NEW MATHEMATICAL MODEL FOR THE VELOCITY DISTRIBUTION IN TURBULENT SHEAR FLOW, Agricultural Research Service, Oxford, Miss. Sedimentation Lab. For primary bibliographic entry see Field 02E. W72-12872

BED-LOAD SEDIMENTS, Australian National Univ., Canberra. Dept. of Geology. A. J. Moss.

Sedimentology, Vol 18, No 3-4, p 159-219, June 1972. 33 fig, 1 tab, 42 ref.

Descriptors: "Bed load, "Sedimentary structures, "Ripple marks, "Dunes, "Sediment transport, Hydraulic models, Regime, Roughness (Hydraulic), Rheology, Saltation, Sand waves, Channel morphology, Alluvial channels.

In natural and artificial bed-load deposits of shallow, unidirectional currents, a textural sequence parallels one of primary structures. With increasing grain size and/or transporting power, sedimentary characteristics followed the stepwise pattern: fine ripple bed stage, coarse ripple bed stage, dune bed stage, rheologic bed stage. Bed roughness strongly influences sedimentation in the first three, the 'bare bed' stages. Respectively, they evidently represent enclosure of particles within the viscous sublayer, their protrusion above the layer which remains influential in their interstices, and the contraction of the layer to insignificance allowing almost fully turbulent flow. Transitions between these bed stages take place on the bed. Transitions involving the rheologic bed stage, however, take place above the bed, reflecting changes in saltation intensity. The rheologic layer, a moving mass of particles kept dispersed by collisions but gravitationally held to the bed, produces distinctive sediments. Ripples and dunes form only if flow conditions near the bed are fairly steady. Ripples, which are sensitive to temporal current direction changes, are more readily prevented from forming than are dunes. The characteristic textural features of the bed stages are shown whether or not the structures develop. The fine to coarse ripple bed stage transition is highly temperature-sensitive and could probably be used as a basis for water palaeothermometry. (Knapp-USGS) In natural and artificial bed-load deposits of shal-

ORIGIN AND DISTRIBUTION OF CALCARE-OUS FINES ON THE CAROLINA CONTINEN-TAL SHELF.

TAL SHELF, Duke Univ., Durham, N.C. Dept. of Geology. B. F. Molnia, and O. H. Pilkey. Sedimentology, Vol 18, No 3-4, p 293-310, June 1972. 13 fig. 37 ref.

Descriptors: *Bottom sediments, *Calcium car-bonate, *Continental shelf, *Provenance, Sedi-mentology, Sedimentation, Calcium, Magnesium, Particle size, Carbonates, Limestones, North Carolina, South Carolina.

Carolina, South Carolina.

The fine carbonate fraction (less than 63 microns in diameter) was studied in 175 sediment samples collected from the Carolina continental margin. This fraction, generally under 5% of the total sample, averages 43% CaCO3. By comparison, the CaCO3 fraction of the total samples averages only 25%. On the inner shelf, the percentage CaCO3 in the fine fraction is 20 or more times greater than the percentage CaCO3 in the total sample. With increased distance offshore, the percentages of CaCO3 in the fine fraction and the total sample approach equality. Beyond the shelf break the percentage of CaCO3 in the total sample is greater than that in the fines. The CaCO3 faunal components are primarily foraminifera, fragments of foraminefera, molluse-barnacle fragments and echinoid material. Minor constituents include alcyonarian and tunicate spicules, Halimeda and other calcified green lagae. Many grains are bored and show solution effects. The coarse carbonate fraction shows distinct regional faunal assemblages, but the fines are essentially uniformly distributed. Two exceptions are a zone of mollusc fragments around Cane Halteras. blages, but the fines are essentially uniformly distributed. Two exceptions are a zone of mollusc fragments around Cape Hatteras and a foraminifera zone on a portion of the outer shelf. The average carbonate mineral assemblage consists of 44% low-Mg calcite, 38% aragonite and 18% high-Mg calcite. The principal modes of origin of calcareous fines on the Carolina continental margin are probably biological and physical destruction of coarser particles and primary formation in fine size fraction (as in the case of some foraminifera). (Knapp-USGS)

Group 2J-Erosion and Sedimentation

GRADED-BED SEQUENCES EMPLACED BY TURBIDITY CURRENTS NORTH OF 20 N IN THE PACIFIC, ATLANTIC AND MEDITER-RANEAN, Lamont-Doherty Geological Observatory,

Lamont-Doherty Geological Observatory, Palisades, N.Y. D. R. Horn, J. I. Ewing, and M. Ewing. Sedimentology, Vol 18, No 3-4, p 247-275, June 1972. 8 fig, 109 ref. ONR N00014-67-0108-004, N00024-70-C-1344.

Descriptors: *Turbidity currents, *Deposition (Sediments), *Sedimentation, *Submarine canyons, Stratigraphy, Pacific Ocean, Atlantic Ocean, Sediment transport, Sampling, Reviews, Suspended load.

Seaward of all major drainage basins of the world lie vast abyssal plains constructed of multiple layers of deep-sea sand and silt alternating with clay. They mark catchment basins of a large por-tion of the terrigenous sediment eroded from neighboring continents. A survey of several hun-dred cores permits definition of the distribution of the deposits of these level features north of 20 deg N latitude. The sediments are products of turbidity flows which have transported material to the ocean basins, have buried the original topography, and have constructed abyssal plains. All core evidence supports the conclusion that abyssal plains are sites of graded-bed sequences deposited from turbidity flows. The deposits appear to be present-day equivalents of thin-to medium-bedded, graded, flysch-type sands and silts of many ancient geosynclines and sedimentary basins. (Knapp-USGS)

STRUCTURE AND PROCESS IN A BRAIDED

RIVER, Ottawa Univ. (Ontario), Dept. of Geology.

B. R. Rust. Sedimentology, Vol 18, No 3-4, p 221-245, June 1972. 14 fig, 3 tab, 26 ref.

Descriptors: *Sediment transport, *Channel morphology, *Braiding, *Alluvial channels, *Sedi-mentary structures, Glacial drift, Canada, Sand bars, Sand waves, Gravels, Sands, Geomorphology, Bed load. Identifiers: *Donjek River (Canada).

The Donjek is a proglacial braided river with a coarse heterogeneous bedload ranging from -7 to +8 phi. Three reaches were studied. In downstream order, they were a zig-zag reach formed by the interaction of the river and tributary fans, a straight reach, and a meandering reach, all with internal braids. The straight to meandering junction is unusual in that slope and discharge both increase. The dominant bed-forms are longitudinal gravel bars, which migrate only during flood. Their internal structure is poorly defined horizontal bedding, which suggests that gravel deposition takes place on the upper bar surfaces, rather than on foreset slopes at the downstream margins. At lower stage sand accumulates in wedge-shaped units lateral to the bars, with internal high-angle cross-stratification and ripple crosslamination; other sedimentary structures are rare. A simple facies model can be constructed on the basis of two trends; a proximal-distal trend, and an active-stable trend. Both result in the increased abundance of fine-grained sediment. Random directional measurements give good estimates of the river trend from small-scale structures (mainly ripples) and from channels; the channels give the closest approximation. The variability of ripple orientation always exceeds that of channels. Both increase in the meandering reach, although the divergence of the vector mean from the river trend is not significantly greater than in the straight reach. (Knapp-USGS) EFFECT OF STEEPNESS AND LENGTH OF SLOPE OF SILEFURES AND LENGTH SLOPE OF SOIL LOSS, College of Agriculture, Gwalior (India). For primary bibliographic entry see Field 02G. W72-1293

2K. Chemical Processes

THE CONTINUOUS DETERMINATION OF SODIUM IN HIGH PURITY WATER BY USING A SODIUM MONITOR INCORPORATING A SODIUM-RESPONSIVE GLASS ELECTRODE, Electronic Instruments Ltd., Chertsey (England). A. A. Diggens, K. Parker, and H. M. Webber. Analyst, Vol 97, No 1152, p 198-203, March 1972. 1 fig, 4 tab, 2 ref.

Descriptors: *Sodium, *Aqueous solutions, *Monitoring, Electrodes, Powerplants, Water analysis, Ions, Automation, Instrumentation, Equipment, Calibrations.

Identifiers: *High purity water, *Ion selective electrodes, Precision, Octadecylamine, Glass electrodes, Amines, Chemical interference, Detection

Tests have been conducted to demonstrate the suitability of a sodium monitoring instrument which utilizes a sodium-responsive glass electrode for power station applications. The sample is pumped continuously through a mixing chamber containing a sodium-responsive glass electrode and a liquid junction tube attached to a reference electrode. Ammonia vapor is fed separately to maintain the necessary alkaline pH during measurement of the sodium ion concentration. The potential developed between the sodium-responsive electrode and the reference electrode is logarithmic with respect to sodium ion concentra-tion. This potential is amplified and its output signal is displayed on a meter and strip-chart recorder. The instrument is designed to determine sodium concentrations as low as 0.0001 ppm and is calibrated up to a maximum of 10 ppm sodium. Results usually lie within plus or minus 10 percent of their true values. The instrument was shown to be basically suitable for monitoring sodium contents of steam and boiler feed and make-up waters, except when filming amines, such as oc-tadecylamine, are present. (Mortland-Battelle) W72-12482

NUCLEAR TECHNIQUES FOR TRACE ELE-MENT AND RADIONUCLIDE MEASURE-MENTS IN NATURAL WATERS, Battelle Memorial Inst., Richland, Wash. Pacific

Northwest Labs.
For primary bibliographic entry see Field 05A. W72-12489

THE INVERSE AUTOCORRELATIONS OF A TIME SERIES AND THEIR APPLICATIONS, North Carolina Univ., Chapel Hill. Dept. of For primary bibliographic entry see Field 07B. W72-12499

AN IMPROVED HOLDER FOR THE DELVES MICROSAMPLING CUP, Perkin-Elmer Corp., Norwalk, Conn. F. J. Fernandez. Atomic Absorption Newsletter, Vol 11, No 2, p 47, March-April 1972. 1 fig.

Descriptors: *Sampling, *Laboratory equipment. Identifiers: *Delves Microsampling Cup, *Atomic absorption spectrophotometry.

The Pt-Ir wire loop previously used to hold the Delves Microsampling Cup was rather fragile and could easily be bent or broken. It also had a tendency to change position slightly when inserted

into the flame. Recent investigations have shown that a cup holder made of Inconel provides a much sturdier mount for the nickel cup. (Holoman-Bat-W72-12501

CHROMATOGRAPHIC SEPARATION OF MOLYBDENUM USING AN ALIPHATIC ALPHA-HYDROXY OXIME, lows State Univ., Ames. Inst. for Atomic Research; and Iowa State Univ., Ames. Dept. of For primary bibliographic entry see Field 05A. W72-12649 Chemistry

INTERPRETATION OF ISOPOTENTIAL POINTS: THE COMMON INTERSECTION IN FAMILIES OF CURRENT BOTTOM IN CURREN State Univ. of New York, Buffalo. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W72-12715

SELF-BALANCING RRIDGE FOR DIF. CAPACITANCE MEASURE. FERENTIAL MENTS, Wayne State Univ., Detroit, Mich. Dept. of Chemistry. For primary bibliographic entry see Field 07B. W72-12716

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PULSED NUCLEAR MAGNETIC RESONANCE MEASUREMENT OF RELAXATION TIMES IN ION-EXCHANGE RESINS, Wisconsin Univ., Madison. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W72-12717

DETERMINATION OF TRACE AMOUNTS OF CHROMIUM (III) USING CHEMILU-MINESCENCE ANALYSIS, Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
For primary bibliographic entry see Field 05A. W72-12719

WATER RESOURCES DATA FOR NEW YORK, 1970: PART 2. WATER QUALITY RECORDS. Geological Survey, Albany, N.Y. For primary bibliographic entry see Field 07C. W72-12862

SELECTED WATER-QUALITY RECORDS FOR TEXAS SURFACE WATERS, 1970 WATER Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 05A.

MULTIELEMENT NEUTRON ACTIVATION ANALYSIS OF BIOLOGICAL MATERIAL USING CHEMICAL GROUP SEPARATIONS AND HIGH RESOLUTION GAMMA SPEC-TROMETRY, Cornell Univ. Ithaca, N.Y. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W72-12924

SIMULTANEOUS MICRODETERMINATION OF NITRATES AND NITRITES BY FERENTIAL GASOMETRIC REACTION. Ain Shams Univ., Cairo (Egypt). Dept. of Chemis-For primary bibliographic entry see Field 05A. W72-12932

CONCENTRATION GRADIENTS IN AQUIFERS, PHASE II, Tulsa Univ., Okla. For primary bibliographic entry see Field 02F. W72-12952

2L. Estuaries

ABNORMAL PRESSURES AND POTENTIAL GEOTHERMAL RESOURCES IN THE RIO GRANDE EMBAYMENT OF TEXAS, Geological Survey, Bay St. Louis, Miss. Gulf Coast Hydroscience Center.

R. H. Wallace, Jr. In: Proceedings of 2nd Symposium on Abnormal Subsurface Pressure, Baton Rouge, La., January 30, 1970: Louisiana State University School of Geoscience and Dept of Petroleum Engineering, p 87-116, 1970. 16 fig. 44 ref.

Descriptors: *High pressure, *Earth pressure, *Water pressure, *Artesian aquifers, *Texas, Geothermal studies, Diagenesis, Faults (Geologic), Clay minerals, Aquicludes, Aquifer characteristics, Sedimentation.

Identifiers: *Rio Grande Embayment (Tex).

Deltaic and near-shore marine deposits of Cenozoic age in the Rio Grande Embayment of Texas contain large quantities of fresh to moderately saline groundwater at abnormally high fluid pressures. Vertical variations in geothermal gradients in zones of geopressure range upward to 16 deg F per 100 feet, and gradients in excess of 2.5 deg F per 100 feet are common. Isogeothermal surfaces at relatively shallow depths in the Rio Grande Em-bayment probably reflect the shift of the center of bayment probably reflect the shift of the center of deposition from south Texas to the Mississippi Embayment during Neogene time. Igneous and metamorphic activity along the margins and within the Rio Grande Embayment have been factors in the upward displacement of isogeothermal surfaces. In the Tabasco-Weslaco area, Hidalgo County, Texas, geothermal gradients and isogeothermal surfaces are strongly affected by growth faulting and diapirism; deep basin hydrodynamic processes, including thermal diagenesis of clay minerals, chemical and thermal osmosis, and redistribution of salinity, are responsible for the hydrologic conditions. Geologic and osmosts, and redistribution of sammy, are respon-sible for the hydrologic conditions. Geologic and hydrologic conditions in the Rio Grande Embay-ment appear favorable for development of geothermal resources. (Knapp-USGS) W72-12410

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SURFACE WATER IN DUVAL AND NASSAU COUNTIES, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 02E. W72-12419

SALINITY CALCULATIONS FROM IN SITU MEASUREMENTS, Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Re-

gon). R. G. Perkin, and E. R. Walker. AIDJEX Bulletin No 13 (Washington University), p 115-125, May 1972. 1 fig, 3 tab, 6 ref.

Descriptors: *Salinity, *Oceans, *Estuaries, *Cold regions, Regression analysis, Mathematical studies, Ice, Equations, Measurement, Specific conductivity, Water temperature, Pressure, Forecasting, Saline water intrusion.

Identifiers: *Salinity calculations, Salinometer.

Six equations are described for calculating salinity on equations are described for calculating saming from measured conductivity, temperature and pressure. The procedures are valid over a temperature range of freezing to +20 deg C and a salinity range of about 4 to 40 parts per thousand. The absolute error within these ranges is less than 0.01 parts per thousand with respect to the averaged pairs per unousand with respect to the averaged data from which the procedures were derived. While intended for use with in situ salinometers in the Arctic, the equations may prove useful for others working in cool estuarial waters. (Woodard-USGS) W72-12427

PLEISTOCENE SUSQUEHANNA RIVER ANNEL CONNECTS THE LOWER A PLEISTOCENE SUSYUEHANNA RIVER CHANNEL CONNECTS THE LOWER REACHES OF THE CHESTER, MILES, AND CHOPTANK ESTUARIES, Johns Hopkins Univ., Baltimore, Md. Chesapeake

Bay Inst. J. R. Schubel, and C. F. Zabawa. Chesapeake Bay Institute Special Report 24 (Reference 72-8), June 1972. 12 p. 2 fig. 8 ref.

Descriptors: *Geologic formations, *Rivers, *Estuaries, *Valleys, *Maryland, Pleistocene Epoch, Erosion, Paleohydrology, Geology, Chesapeake Bay, Channels, Geologic investigations, Channel morphology.

Identifiers: *Susquehanna River.

A continuous-seismic-reflection-profiling study showed that the valleys of the lower reaches of the Chester, Miles, and Choptank Rivers, Maryland are parts of a Pleistocene valley cut by the Susquehanna River during a period of lowered sea level. The paleochannel was cut before the formation of the modern Chesapeake Bay basin. The sound source used was a modified E.G. and G. boomer--a displacement type sound source. The sound source utilizes stored electrical energy to displace a submerged plate and the surrounding water, thus generating a pressure pulse. The unit was towed on a specially designed catamaran. Line drawings of the records from the transects are presented. The records clearly reveal an an cient river channel buried 40-50 meters beneath the modern estuary floor. (Woodard-USGS) W72-12428

FRESH WATER AND ESTAURINE SPECIFIC GRAVITY DIAGRAMS, State Univ. Coll., Fredonia, N.Y. For primary bibliographic entry see Field 05A. W72-12458

CHEMICAL EFFECTS OF SALMON DECOM-POSITION ON AQUATIC ECOSYSTEMS, Alaska Univ., College. Inst. of Marine Science. For primary bibliographic entry see Field 05C. W72-12556

STRUCTURE AND FUNCTIONING OF ESTUARINE ECOSYSTEMS EXPOSED TO TREATED SEWAGE WASTES.
North Carolina Univ., Chapel Hill. Inst. of Marine Sciences. For primary bibliographic entry see Field 05C. W72-12567

MARINE OF STUDIES ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES. North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 05C.
W72-12568

STUDY OF MIGRATORY PATTERNS OF FISH AND SHELLFISH THROUGH A NATURAL

Texas Parks and Wildlife Dept. Austin. For primary bibliographic entry see Field 05C. W72-12579

GULF INTRACOASTAL WATERWAY, TEXAS SECTION, (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Galveston, Tex. For primary bibliographic entry see Field 04A. W72-12604

EXTENSION OF OCEANOGRAPHIC STUDIES IN PUGET SOUND AND THE NORTHEAST PACIFIC OCEAN, Washington Univ., Seattle. Dept. of Oceanog-

raphy.
F. A. Richards.
Available from the National Technical Information Service as AD-735 952, \$3.00 in paper copy, \$0.95 in microfiche. Report No. Ref-A71-57, December 1971. 38 p. Contract No. Nonr-477 (37).

Descriptors: *Oceanography, *Sampling, *Analytical techniques, *Mathematical models, *Data processing, Seawater, Washington, Oregon, Columbia River, Estuaries, Coasts, Phytoplankton, Zooplankton, Arctic Ocean, Detritus, Organic matter, Pumps, Copepods, *Pacific Ocean, Water properties, Physical properties, Chemical properties, Metals, Trace elements, Nutrients, Fjords, Oxygen, Sulfides, Heavy metals, Zinc, Lead, Cadmium, Copper, Nitrites, Dissolved oxygen, Sediments, Bottom sediments, Geomorphology, Instrumentation, Geophysics, Water temperature, Salinity, Currents, Flow rates, Circulation, Tides, Hydrodynamics, Cyclones, Discharge (Water), Atmospheric pressure, Waves, Computer programs, Statistical analysis, Bibliographics, Pumps Identifiers: *Puget Sound, Caribbean Sea, Voltammetry, Anodic stripping voltammetry, Volcanics, Tectonics, Radiolaria, Plankton pumping system.

Laboratory and field studies in the areas of biological, chemical, geological, and physical oceanography, and studies in the use of statistical interference and experimental design in the collection and interpretation of data were carried out over a 6-year period. Very brief summaries of the work done in each of these areas are presented, and an extensive bibliography of papers and reports resulting from the research is provided. (Mortland-Battelle) Rattella W72-12639

THE EFFECTS OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF PIKE PERCH YEARLINGS (LUCIOPERCA) AND ROACH YEARLINGS (RUTI-CIOFERCA) AND KUACH TEARLINGS (RUTI-LUS RUTILUS HECKELI (NORDM.)) IN VARI-OUS REGIONS OF THE SEA OF AZOV, Azovskii Nauchno-Issledovatelskii Institut Ryb-nogo Khozyaistva, Rostov-na-Donu (USSR). For primary bibliographic entry see Field 05C. W72-12645

SUBMARINE CANYONS, Scripps Inst of Oceanography, La Jolla, Calif. For primary bibliographic entry see Field 02J. W72-12700

WATER RESOURCES DEVELOPMENT IN THE MULLICA RIVER BASIN, PART I, BIOLOGI-CAL EVALUATION OF THE MULLICA -CAL EVALUATION OF THE MULLIAGA GREAT BAY ESTUARY,
Rutgers - The State Univ., New Brunswick, N. J.
Water Resources Research Inst.
J. B. Durand, and R. J. Nadeau.
Available from the National Technical Informa-Avanage from the National Technical Informa-tion Service as PB-211 330, \$3.00 in paper copy, \$0.95 in microfiche. Partial Completion Report, July 1972. 138 p, 32 tab, 49 fig, 26 ref, 3 append. OWRR A-018-N.J., B-014-N.J., B-018-N.J (3).

Descriptors: *Estuarine environment, *Fish, *Nutrients, *Salt tolerance, *Zooplankton, *Withdrawal, *Shellfish, Estuaries, Fish food or-

Group 2L—Estuaries

ganisms, Fish populations, Salinity, Aquatic microorganisms, *New Jersey, Biological commu-Identifiers: *Mullica River-Great Bay Estuary

The objectives were to determine the maximum possible shipment of water out of the basin that could take place without damage to the ecology of the river-bay system. The water resources of the basin are essentially untapped and the natural hydraulic state of the surface and ground waters were intact. Aquatic biologists had been collecting data on the biological systems for about a decade and within this decade the most severe drought of record occurred. As the flow of fresh water from the basin changes, the salinity changes in the estuary. Also the fluvial flow brings nutrients to the estuary. Thus, the effect of removal of water from the basin over a long period of time was simulated by the natural occurrence of drought. Based upon the observations made over the periods of low and of average and of high flows of fresh water, base lines of desired minimum average flows were drawn for each month of the year. ipple-Rutgers) W72-12706

LEAD IN A CONNECTICUT SALT MARSH. Yale Univ., New Haven, Conn. School of For primary bibliographic entry see Field 05B.

PLANNING PLANNING AND IMPLEMENTATION OF REMOTE SENSING EXPERIMENTS. Texas A and M Univ., College Station. Remote Sensing Center. For primary bibliographic entry see Field 05B. W72-12712

PHYTOPLANKTON PIGMENTS IN PORTO NOVO WATERS (INDIA), Center of Advanced Study in Marine Biology, Porto Novo (India). For primary bibliographic entry see Field 05A.

THE EFFECT OF CHINA CLAY ON THE SEDI-MENTS OF ST AUSTELL AND MEVAGISSEY

Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab. For primary bibliographic entry see Field 05C. W72-12792

ORIGIN AND DISTRIBUTION OF CALCARE-OUS FINES ON THE CAROLINA CONTINEN-TAL SHELF Duke Univ., Durham, N.C. Dept. of Geology.

For primary bibliographic entry see Field 02J. W72-12880

THE WINTER FLOUNDER (PSEUDOPLEU-THE WINTER FLOUNDER (FSEUDVILLE)
RONECTES AMERICANUS) IN LONG POND,
CONCEPTION BAY, NEWFOUNDLAND,
V.S. Kennedy, and D. H. Steele.
J. Fish Res. Bd. Can. Vol. 28, No. 8, p. 1153-1165.

1971. Ilius. Maps. Identifiers: "Life history studies, Canada, Conception Bay, "Flounder, Long Pond, Mollusks, Newfoundland, Plants, Polychaetes, Pseudopleu-

Monthly samples of winter flounder taken in Long Pond from Nov. 1962 to Oct. 1963 indicated that the flounder moved into deeper water (7-10 m) during the summer and returned to shallow water (1-2 m) from Sept. to June. These movements cor-responded to the end of the spawning season and the ripening of the gonads respectively. Spawning occurred from March until early June, most of it in May and early June. Most males were mature at age 6 and most females at age 7. Fifty percent of the males and females were mature at 21 and 25 cm respectively. The growth rates of the males and females were similar until the age of 8, after which the females apparently outgrew the males. Early growth and fecundity were similar to those re-ported for other areas. No feeding took place in Dec. or Jan. but the flounder fed in March and continued to feed throughout the summer; food in-take decreased in the fall. They were omnivorous and the type of food eaten varied with the locality. Polychaetes, plant material, and mollusks were the Polychaetes, paint material, and monuss were the most common food items throughout the year. Capelin eggs and fish remains were found only during a few months of the year but were eaten in great quantities.—Copyright 1972, Biological Abstracts, Inc. W72-12925

INTERDISCIPLINARY MONITORING OF THE NEW YORK BIGHT, Research Dept. For primary bibliographic entry see Field 05A. W72-12941 Grumman Aerospace Corp., Bethpage, N.Y.

SOME ASPECTS OF POLLUTION IN SOUTHAMPTON WATER, Southampton Univ. (England). Dept. of Oceanog-POLLUTION IN For primary bibliographic entry see Field 05C.

THE VEGETATION OF MARSHES, PONDS AND RIVER BANKS IN SHIVPURI, MADHYA PRADESH.

Government Science Coll., Gwalior (India). J. P. Kaushik.

Bull Bot Surv India. Vol 11, No 1/2, p 84-88. 1969. Identifiers: *Madhya Pradesh (India), *Marshes, *Ponds, Record, Ruppia maritima M, *Vegetation.

Phenology and distribution are included. The vegetation is compared with that of other parts of Madhya Pradesh. Species collected included 101 ssp. in 82 genera and 37 families. Ruppia maritima is a new record.—Copyright 1972, Biological Abstracts. Inc. W72-13003

AN ECOLOGICAL STUDY OF GALLINAS CREEK, A SLOUGH OF THE SAN FRANCISCO BAY SYSTEM: I. HYDROGRAPHY, MATERI-ALS AND METHODS.

ALS AND METHODS, San Francisco Univ., Calif. Dept. of Biology. A. Mahood, and F. P. Filice. Wasmann J Biol. Vol 28, No 2, p 219-232. 1970. Il-

Hydrography, Materials, Methodology, Plankton, San Francisco Bay, Slough.

Plankton samples were collected from various sta-tions in Gallinas Creek slough over 4 different tidal cycles. At the same time, physical and chemical characteristics were determined in order to un-derstand the ecology of the microplankton in the stream.—Copyright 1972, Biological Abstracts, W72-13006

ENVIRONMENTAL FACTORS AFFECTING SEEDLING ESTABLISHMENT OF THE BLACK MANGROVE ON THE CENTRAL TEXAS COAST

COASI, Texas Univ., Austin. Dept. of Botany. C. McMillar Ecology. Vol 52, No 5: p 927-930. 1971. Illus. Identifiers: *Environmental effects, Avicennia germinans D, *Black mangrove, Coasts, Depth, Environment, Salinity, Seedlings, Temperatures, *Texas, Turbulence

The effects of salinity, water turbulence, water depth, and temperature on the establishment of seedlings of black mangrove (Avicennia germinans L.) on the central Texas coast were evaluated in the laboratory. Salinity was not the chief factor limiting seedling establishment, because seedlings rooted in distilled water and in salinities approaching twice the concentration of sea water. Water turbulence, either of distilled or sea water, inhibited root and seedling development. Seedlings tumbled for as much as 12 wk showed rapid root development when subsequently stabilized. Various water depths promoted extensive root systems, but seedlings did not become established until water depth was reduced to 5 cm or less. High until water depth was reduced to 5 cm or less. High temperature treatment, exposure to 39-40C for 48 hr was lethal to stemless seedlings, but not to seedlings with stems and roots. The results suggest that viviparous development in this A. germinans population is probably phenologically timed by enpropulation is probably phenologically timed by environmental relations during winter and early spring as a protection against the lethal effects of the high temperatures that prevail on beaches and in shallow water during late spring and summer.—Copyright 1972, Biological Abstracts, Inc. W72-13009

TAGGING OF WHITE HAKE, UROPHYCIS TENUIS MITCHILL, IN THE SOUTHERN GULF OF ST. LAWRENCE,
Fisheries Research Board of Canada, St. Andrews

(New Brunswick). Biological Station. A. C. Kohler.

Int Comm Northwest Atl Fish Res Bull. 8, p 21-25. 1971. Illus. Maps.

Identifiers: Canada, *White Hake, Movements, Petersen, *Gulf of St. Lawrence, *Tagging, Urophycis-Tenuis.

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White hake (2271), U. tenuis Mitchill, were tagged with yellow Petersen disc tags in the southeastern Gulf of St. Lawrence in Aug. 1967. This was the first recorded mass tagging of hake. A total of 603 returns had been received to the end of 1969. returns had been received to the end of 1969. Previous attempts to tag hake had been foiled by mortalities caused by rapidly and greatly expanding air bladders. High mortalities were avoided in this experiment by choosing a relatively shoal water tagging area and by using a hypodermic needle to remove excess air bladder gas. Returns from the tagging indicated that this hake population was resident in the southern Gulf of St. Lawrence the year round. Moyements of the fish around Prince vear round. Movements of the fish around Prince Edward Island and toward the western shore of Cape Breton were recorded.—Copyright 1972, Biological Abstracts, Inc. W72-13028

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PWR WATER: VARYING CHEMISTRY AND HOT' CONTAMINANTS, Westinghouse Electric Corp., Pittsburgh, Pa. For primary bibliographic entry see Field 05D. W72-12465

PRODUCING FRESH WATER FROM BRINE, Long Beach Dept. of Water, Calif. W. B. Murray. Water and Sewage Works, Vol 119, No 1-2, Part I-II, p 40-43, 54-57, Jan-Feb 1972. 7 fig, 2 tab, 8 ref.

*Freshwater, Descriptors:

Descriptors:

Demineralization, "Nuclear powerplants, "Fog,
"Evaporation, "Desalination, Electric power
production, Geothermal studies, Water sources,
Water resources development, Costs, Precipitation (Atmospheric), Oceans, California, Thermocline, Nuclear desalting.

Identifiers: *Geothermal power, Nuclear power, Geothermal resources, Evaporation reservoirs, Nuclear desalting.

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Several methods of producing fresh water from brine are discussed. Fresh water may be extracted from salt water in the process of nuclear power generation, through use of geothermal steam and brine, and by the production of coastal fog. Although recovery methods differ, in each instance, the energy necessary for system operation is obtained from the process itself. A 1000-mw is obtained from the process itself. A 1000-mw nuclear power station equipped with special condensing devices could produce fresh water at the rate of 30 to 36 mgd. Recovery processes and costs are reviewed. Use of geothermal steam as a source of heat and water to saturate dry desert air is discussed. By passing the saturated air through large existing fresh water supply, water could be recovered by natural condensation. A third method produces coastal fogs moving inland and depositing water by atmospheric precipitation. method produces coastal logs moving inland and depositing water by atmospheric precipitation. The sea fog could be created artificially by pumping the cold sea water from below the thermocline to the surface of the ocean at locations just off the coast of Southern California and allowing the fog to be swept inland by wind. The fog cools the land areas, causing rain to fall. (USBR) W72-12661

3B. Water Yield Improvement

WATER USE EFFICIENCY IN PLANT GROWTH AND AMBIENT CARBON DIOXIDE

LEVEL, Texas A and M Univ., College Station. Water Resources Inst. C. H. M. Van Bavel.

Available from the National Technical Information Service as PB-211 281, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report No 42, June 1972. 115 p. 28 fig, 10 tab, 39 ref, 2 append. OWRR A-013-TEX (1).

Descriptors: *Carbon dioxide, Evapotranspira-tion, Hydrology, *Micrometeorology, Plant physiology, *Stomata, Stomatal resistance, *Transpiration, *Water conservation, Water use efficiency, Photosynthesis, Humidity, Antitrans-pirants, Model studies, Computer programs, Soybeans.

Identifiers: Carbon dioxide assimilation, Carbon dioxide level, Stomatal sensitivity, Pepper, Southern pea plants.

The validity and practical implications are discussed of the proposition that CO2 enrichment of the leaf environment enhances plant growth and, simultaneously, decreases plant water use. A theoretical analysis of the water and carbon dioxide balance of plant leaves was made in the form of a computer program based upon known physiological facts. It predicts significant increases in water use efficiency by plants as CO2 is enriched, the size of the increase depending upon the external conditions. Experimental tests were conducted in an environmental simulator with stands of soybean, pepper and southern pea plants. The predictions of the model were substantially verified, with CO2 concentrations ranging from normal to six-fold normal. Although CO2 is obviously an ideal antitranspirant, the efficacy of obviously an ideal antitranspirant, the efficacy of its release in open stands is doubtful in view of plausible economic factors. But, in enclosures this would be a different matter, and for such situa-tions a scientific basis is given for engineering and systems analysis. (Runkles-Texas A and M) W72-12391

AVAILABILITY OF WATER IN KALAMAZOO COUNTY, SOUTHWESTERN MICHIGAN, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B. W72-12408

ABNORMAL PRESSURES AND POTENTIAL GEOTHERMAL RESOURCES IN THE RIO GRANDE EMBAYMENT OF TEXAS, Geological Survey, Bay St. Louis, Miss. Gulf Coast Hydroscience Center. For primary bibliographic entry see Field 02L. W72-12410

MAJOR AQUIFERS AND SAND AND GRAVEL RESOURCES IN MARSHALL COUNTY, SOUTH DAKOTA, Geological Survey, Huron, S. Dak. For primary bibliographic entry see Field 04B. W72-12412

GROUNDWATER LEVELS IN NEBRASKA-–1971, Geological Survey, Lincoln, Nebr. For primary bibliographic entry see Field 04B. W72-12433

WATER USE STUDIES ON FORAGE GRASSES WATER USE STUDIES ON FURAGE GRASSES
IN NORTHERN NEVADA,
Nevada Agricultural Experiment Station, Reno,
and Agricultural Research Service, Reno, Nev.
Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W72-12522

EVALUATION OF TRANSPIRATION SUPPRESANTS AS AN ALTERNATIVE TO THE ERADICATION OF SALTCEDAR THICKETS, Arizona Univ., Tucson. Dept. of Watershed R. S. Cunningham. M.S. Thesis, 56 p, 1972. 17 tab, 4 fig, 57 ref.

Descriptors: *Transpiration control, *Water management (Applied), *Evapotranspiration, *Water yield improvement, *Tamarisk, Water conservation, Wildlife inhabitats, Evaluation, Weed control, Consumptive use, Arid lands, Planting management, Environmental effects, Consumptive Control (Consumptive Control Contr freenhouses, Experimental farms, Costs, Public health, Riparian water loss. Identifiers: Chemical antitranspirants.

The exotic river bottom plant, saltcedar (Tamarisk), is a western weed which consumes large quantities of water. Saltcedar eradication water conservation has met opposition from those considering cedar thickets to be essential wildlife habitat. Chemical artitages in the constant of the habitat. Chemical antitranspirants reduce trans-piration and reallocate water to underflow or chanpiration and reallocate water to underflow or channel flow without harming the plant, environment or human health. Two greenhouse and 2 field experiments with 8-HQS (eight-hydroxyquinoline sulfate) and MDSA (mono-methyl ester of n-decenylsuccinic acid) indicate both compounds were equally effective in reducing saltcedar transpiration, though both compounds were most effective in the greenhouse. Reallocated water may cost 44 dollars per acceptor, if examples are first former for the first per acceptor of the first per acceptor of the first per acceptor. At dollars per acre-foot if evapotranspiration (ET) of a thicket is reduced by 35 percent for 2 weeks. Reallocated water costs 200 dollars per acre-foot if only a 15 percent reduction in ET is achieved for 1 week. (Popkin-Arizona) W72-12523

INFILTRATION RATE AND SEDIMENT PRODUCTION TRENDS ON A PLOWED BIG

SAGEBRUSH SITE, Utah State Univ., Logan. Dept. of Range Science. For primary bibliographic entry see Field 02G. W72-12526

FLORIDA CUMULUS SEEDING EXPERIMENT FOR DROUGHT MITIGATION, APRIL-MAY 1971, National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Environmental Research Labs.

W. L. Woodley, J. Simpson, A. H. Miller, J. J. Fernandez-Partagas, and W. Riebsame. Available from the National Technical Information Service as COM-72-10149, \$3.00 in paper copy, \$0.95 in microfiche. National Oceanic and Atmospheric Administration Environmental Research Laboratories Technical Memorandum ERL OD-9, November 1971. 160 p, 60 fig. 7 tab, 12 ref.

Descriptors: *Cloud seeding, *Silver iodide, *Artificial precipitation, *Florida, Weather modification, Aircraft, Clouds, Droughts, Rainfall, Rain gages, Data collections.

gages, Data collections.

In the 61-day operational period from April 1 to May 31, 1971, flights were conducted in central and southern Florida on 16 days, with actual seeding on 14 days. Real time runs of the EML one-dimensional cumulus model on the 1200 GMT Miami radiosonde eliminated 38 days as unseedable; seven additional seed days might have been obtained had a back-up seeder aircraft been available. Altogether, 2066 fifty-gram Agl flares were dropped into 196 clouds or cloud complexes. Severe drought and cloud scarcity forced abandonment of planned randomization. Evaluation was by rain gages and 10-cm radars, the WSR-57 of the National Weather Service and the calibrated radar of the University of Miami. Altogether, seeded clouds produced about 180,000 acre-feet of rain. Conservative estimates ascribe about 100,000 acre-feet to seeding, leading to a benefit-to-cost ratio for the program exceeding thirty-to-one. The seeding could not break the drought and contributed only about 3% of the water or 5% to 10% of the actual two-monthly rainfall in south Florida. Nevertheless, the seeded precipitation was highly beneficial locally and quenched numerous drought-produced fires. (Woodard-USGS)

COLLECTION EFFICIENCY OF WATER DROPLETS IN AGCL AEROSOL, Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemistry; and Clarkson Coll. of Technology, Pottsdam, N.Y. Inst. of Colloid and Surface Science.
For primary bibliographic entry see Field 05B. W72-12763

STREAMFLOW MODIFICATION THROUGH MANAGEMENT OF EASTERN FORESTS, Forest Service (USDA), Asheville, N.C. Southeastern Forest Experiment Station. J.E. Douglass, and W.T. Swank. USDA Forest Service Research Paper SE-94, May 1972, 15 p., 19 ref.

Descriptors: *Vegetation effects, *Water yield im-provement, *Streamflow forecasting, *Water resources development, *Watershed management, Hardwood, Timing, North Carolina, Stream im-provement, Regression analysis. Identifiers: Experimental watersheds, *Appalachi-on Hieblands

Equations for predicting the first-year increase, duration of the increase, and the total volume of water which occurs from cutting forests are water which occurs from cutting forests are presented. The equations are based on a summary of 22 experimental cuttings of hardwood forests in the Appalachian Highlands. Predicted yields are compared with actual yields obtained from a logged watershed. The effects of forest cutting on the seasonal distribution of increased annual flow, stormflow peaks and volumes, and water quality characteristics are discussed. (Douglass-Forest Service) W72-12810

MANAGING A PONDEROSA PINE FOREST TO INCREASE WATER YIELDS, Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3B-Water Yield Improvement

L. R. Rich. Water Resources Research, Vol 8, No 2, p 422-428, 1972, illus,

Descriptors: *Watersheds, *Water yield, *Forests, *Sediment yield, Trees, Wildlife, Streamflow, *Forest management, *Arizona. Identifiers: *Timber harvest, *Even-aged management, *Forest ecosystem, *Castle Creek (Ariz), Wood, Scenic values, Winter precipitation, Summer precipitation, Summer precipitation.

A forest ecosystem managed for social goals of water, wood production, wildlife, scenic values, and sediment control was applied to the West Fork watershed, Castle Creek, after a 10-year calibra-tion period. Water yields have improved signifi-cantly following this timber harvest and improvement cut. During the posttreatment period an in-crease of 1.4 inches of water was measured during a year of high runoff when 8.77 inches was yielded from the control watershed. In contrast, during years of low runoff when the water yield averaged 0.5 inch from the control watershed, the increase averaged more than 0.4 inch. Streamflow is intermittent. Winter precipitation has been the major source of water yields. Summer rains duiring June through September have accounted for nearly 46% of the annual precipitation but less than 10% of the streamflow. No measurable quantities of sediment have been trapped in the pond above the measur-ing weir. (Rich-Forest Service)

MANAGEMENT PROBLEMS IN PHREATOPHYTE AND RIPARIAN ZONES, Forest Service, (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station

J. S. Horton. Journal of Soil and Water Conservation, Vol 27, No 2, p 57-61, 1972, illus.

Descriptors: *Phreatophytes, *Riparian plants, Descriptors: *Phreatophytes, *Riparian plants, *Tamarisk, *Plxapotranspiration, *Water yield im-provement, Flood control, Flood plains, Wildlife habitats, Wildlife conservation, Mesquite, Sycamore trees, *Arizona, *Southwest US. Identifiers: *Doves, *Honey production, *Phreatophyte management, Phreatophyte clear-ing, Gila River, Tamarisk invasion.

Utilization of the resources of streams, rivers, and flood plains has always received a great deal of attention in the arid Southwest. After the invasion of the aggressive tamarisk some 40 years ago, removal of phreatophyte vegetation for water savings was felt to be paramount. Now the need for wise evaluation of these possible savings in comparison with other resources inherent phreatophyte and riparian stands has come into prominence. Recreational use, wildlife protection, honey production, erosion prevention, and preservation of esthetic values must all be considered for optimum management. (Horton-Forest Service) W72-12814

EDAPHIC ARIDITY AS A FACTOR IN AN-GIOSPERM EVOLUTION. California Univ., Davis. Depts. of Geology; and

California Univ., Davis. Dept. of Botany. D. I. Axelrod.

American Naturalist, Vol. 106, No. 949, p. 311-320, May-June 1972. 2 fig, 11 ref.

Descriptors: *Xerophytes, *Ecological distribu-tion, *Ecosystems, *Evolution, *Plant popula-tions, Tropical regions, Soil environment, Soilwater-plant relationships, Soil moisture, Environ-mental effects, Mode of action, Topography, Climate, Geological formations. Identifiers: *Edaphic aridity.

Plant evolution would be relatively rapid in arid and semiarid regions because where moisture is limited local physical differences would have a much greater effect on vegetation than in regions where moisture is not limited. Such regional diver-sity quickly promotes the semi-isolation of small populations that may give rise to new taxa. Addipopulations that may give rise to new taxa. Additionally, in moister periods, the xerophytes with the right potentialities could give rise to mesophytic groups. While the importance of these factors is not questioned, an alternative evolutionary mechanism is postulated as a result of observations in Brazil. There, ancient terrain of grantitic and metamorphic rocks form steep sided mountains, domes, ridges and plains, and provide steeply decreasing edaphic moisture gradients from arid sites to tronical rain forest or other cliarid sites to tropical rain forest or other climatic regions. Examination of topographies in other parts of the world provides many similar examples of varying geologic age. Such steep gradients together with their scattered distribution has resulted in the provision of environmental opportunities that have encouraged the origin of taxa adapted to varying grades of drought. Not only may such arid sites have served as loci from which some taxa readapted to nearby moister sites, but they also appear to have served as local refuges for drought-adapted taxa during moister climatic periods. (Casey-Arizona) W72-12828

WATER POTENTIAL, PHOTOSYNTHESIS, PHOTOSYNTHATE C-14-LABELED UTILIZATION, AND GROWTH IN THE DESERT SHRUB LARREA DIVARICATA CAV, California Univ., Riverside. Dept. of Life Sciences. W. C. Oechel, B. R. Strain, and W. R. Odening. Ecological Monographs, Vol. 42, No. 2, p 127-141, Spring 1972. 13 fig, 43 ref.

*Photosynthesis. Descriptors: *Xerophytes, *Plant growth, *Water balance, *Environmental effects, Shrubs, Arid lands, Chemical potential, Phenology, Metabolism, Ecological distribution, Respiration, Leaves, Physiological ecology, Plant physiology.
Identifiers: *Plant water potential.

Larrea divaricata is an evergreen xerophytic shrub, abundant in the warm arid regions of both North and South America. It seems well adapted to withstand and even grow in periods of both moisture and temperature stress. Past field observations have indicated that growth may occur at any time of the year, if moisture is not limiting. Attempts were made to evaluate seasonal variation in photosynthesis in relation to the plant's adaptation to its environment and to elucidate the patterns of utilization of seasonally produced photosynthate in growth and metabolic processes. Measurements were made of tissue water potential in relation to phenology, photosynthesis, and analyses of seasonal C-14 labeled photosynthate distributions. The seasonal water-potential pattern reflected climatic changes closely and was the most important factor in the control of phenological events, photosynthesis, and productivity, in a population growing in Deep Canyon, near Palm Desert, California. Reproductive structure development was initiated at the time of highest water potential and terminated with declining water potential. and terminated with declining water potentials. Both leaf growth and node growth proceeded at both lear growth and node growth proceeded at varying rates throughout the year and were sup-ported by photosynthates. This photosynthate utilization from various tissue fractions was similar in all seasons and there was no seasonal tis-sue storage. The year round growth and development is an important adaptation probably account-ing for its wide range. (Casey-Arizona) W72-12851

GERMINATION, EMERGENCE, WATER USE, AND PRODUCTION OF RUSSIAN-THISTLE (SALSOLA KALI L.),

Utah State Univ., Logan. Dept. of Range Science. Don D. Dwyer, and K. Wolde-Yohannis. Agron J. Vol 64, No 1, p 52-55, 1972. Illus.

Identifiers: *Plant physiology, Emergence, Germination, Crop production, *Russian Thistle D, Salsola kali D, Xerophytes.

Studies of Russianthistle (Salsola kali L.) have shown that it is a plant well suited to arid and semiarid regions. This study was conducted to learn some of the characteristics of the species related to germination and water use that allow it to sucd in these dry areas. Russianthistle seeds were planted in a sandy soil, and various amounts of simulated rainfall were added once. Emergence occurred in 14 hr when as little as 7.6 ml (0.3 in.) was applied. There was no significant difference in numbers of plants emerging and surviving to permanent wilting from 12.7 ml (0.5 in.) to 27.9 ml (1.1 in.) of simulated rainfall. Germination studies showed that Russianthistle seed germinated from 4-68 C with optimum germination from 7-35 C. Plants were grown for 90 days (to maturity) at 4 soil moisture levels--field capacity, 0.5, 0.2, and 0.1 available water--to determine water use production. Shoot production was greatest at field capacity and least when soil was maintained at 0.1 available water. However, efficiency of water use was greatest at 0.1 available water, requiring only 98 g of water per dry-weight gram of shoot produced. Even under field capacity, Russianthistle used only 181 g of water per dry-weight g of shoot and root produced.—Copyright 1972, Biolog-ical Abstracts, Inc. W72-12911

CONTACT BETWEEN THE PSEUDOSTEPPE WITH TAMARIX AND THAT WITH ZILLA MACROPTERA IN THE REGION OF BENI--ABBES, (IN FRENCH), Caen Univ. (France). Laboratoire de Physiologie

Vegetale.

P. Binet, and A. Coudret.

Nat Monspeliensia Ser Bot. 21: p 9-21. 1970. Illus. Map. English summary. Identifiers: Algeria, Beni-Abbes, *Halophytes,

Moisture, Pseudosteppe, Salinity, Soil, *Tamarix-D, Texture, *Xerophytes, *Zilla-Macroptera-D.

A study of the soils and vegetation of an area where some wadi halophytes and some hamada xerophytes intermingle emphasizes the important part played by moisture content, salinity, and tex-ture of the soil in the establishment and survival of some Saharan plant species.—Copyright 1972, Biological Abstracts, Inc.

3C. Use of Water of Impaired **Ouality**

TRANSACTIONS OF THE THERMAL EF-FLUENT INFORMATION MEETING. For primary bibliographic entry see Field 05D. W72-12466

UTILIZING WASTE HEAT FOR URBAN SYSTEMS, Westinghouse Electric Corp., Pittsburgh, Pa For primary bibliographic entry see Field 05D. W72-12468

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HEATED WATER IN AQUICULTURE. Oregon State Univ., Newport. Dept. of Fisheries and Wildlife. For primary bibliographic entry see Field 05C. W72-12469

UTILIZATION OF HOT GROUNDWATER IN ELMORE AND OWYHEE COUNTIES, IDAHO, Idaho Dept. of Water Administration, Boise. For primary bibliographic entry see Field 05D.

CONSTRAINTS AND GUIDELINES IN HAR-NESSING NUCLEAR POWER PLANT WASTE HEAT, Idaho Nuclear Corp., Idaho Falls. For primary bibliographic entry see Field 05D. W72-12472

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THERE'S GOLD IN THEM THAR BTUS, Washington State Office of Nuclear Energy Development, Olympia.
For primary bibliographic entry see Field 05D.
W72-12473

THE THERMAL-WATER HORTICULTURAL DEMONSTRATION PROJECT AT SPRING-FIELD, OREGON, Vitro Corp. of America, Portland, Oreg. For primary bibliographic entry see Field 05D. W72-12474

SULFATE SALINIZATION OF SOILS IN THE AK-DAR'YA RAYON OF THE SAMARKAND OBLAST (O SUL-FATNOM ZASOLENII POCHV AKDAR'INSKOM RAYONE SAMARKAND-SKOY OBLASTI),

Selskokhozyaistvennyi Institut, Samarkand

Ch. N. Takhtamyshev. Pochvovedeniye, No 11, p 160-164, November 1971. 1 fig, 4 tab, 6 ref.

Descriptors: *Salinity, *Salts, *Sulfates, *Calcium sulfate, *Sodium sulfate, Metals, Carbonates, Bicarbonates, Chlorides, Water table, Groundwater, Soils, Soil profiles, Soil analysis, Water analysis, Sampling, Crops, Cotton.
Identifiers: *USSR, *Uzbek SSR, *Samarkand Oblast, *Magnesium sulfate, *Meadow soils, Mineralization.

Investigations of soils of irrigated cotton fields in the Zeravshan River valley in 1968 were based on analyses of 22 soil and 4 groundwater samples taken from 10 soil profiles of Meadow soils in the Ak-Dar'ya Rayon of the Samarkand Oblast in Uzbek SSR. The upper soil horizons contain large amounts of MgS04, CaS04, and Na2S04, which have a deleterious effect on cotton and other crops. Sulfates account for about 84%-86% of the salts in the soils and MgS04 for 31%-55% of the total salt concentration. Special remedial measures and management practices to increase soil productivity are recommended and include improvement and management practices to increase soil protocon-tivity are recommended and include improvement of water conveyance and drainage systems, periodic leaching of the soil, selection of salt-tolerant crops, and use of land-preparation and til-lage methods that aid in salinity control. (Josefson-USGS) W72-12690

SOME UNRESOLVED PROBLEMS IN SOIL SODIUM-CARBONATE SALINIZATION (O NEKOTORYKH NEYASNYKH VOPROSAKH SODOVOGO ZASOLENIYA POCHV), Akademiya Nauk SSSR, Moscow. Pochvennyi Institut

Stitut. V. V. Yegorov. Poshvovedeniye, No 11, p 126-136, November 1971. 2 tab, 14 ref.

Descriptors: *Land reclamation, *Salinity, *Salts, *Carbonates, *Sodium, Magnesium, Calcium, Inorganic compounds, Sulfur compounds, Aqueous solutions, Chemical reactions, Water chemistry, Water analysis, Geochemistry, Mineralogy, Hydrogeology, Groundwater, Crystalline rocks, Irrigation, Irrigation water. Identifiers: *USSR, *Sodium carbonate, Salinity hazard, Mineralization, Steppe soils.

Existing theories are reviewed regarding the for-mation of sodium carbonate and its spontaneous disappearance from natural solutions where it first

appears and accumulates. Sodium carbonate is beappears and accumulates. Sodium carbonate is be-lieved to form from the weathering of primary, acid massive-crystalline rocks and their deriva-tives. The disappearance of sodium carbonate is attributed to its exchange reactions with readily-soluble magnesium salts, which are first to dis-solve and earlier to migrate to solution concentra-tion zones. Primary consideration is given to salinity and sodium hazards involved in irrigation of steppe soils without adequate drainage. (Josef-son-USGS) W72-12692

POLYSACCHARIDES IN MOLASSES MEAL AS AN AMELIORANT FOR SALINE-SODIC SOILS COMPARED TO OTHER RECLAMATION AGENTS, Stellenbosch Univ. (South Africa). Dept. of Soil

Science.
For primary bibliographic entry see Field 02G.
W72-12825

PHYSICAL AND PHYSICO-CHEMICAL CHANGES IN THE PROFILE OF A SODIC SOIL TREATED WITH GYPSUM, Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Rivernina

For primary bibliographic entry see Field 02G. W72-12833

QUALITY OF WATER FOR IRRIGATION, Agricultural Research Service, Riverside, Calif. Salinity Lab. J. D. Rhoades. Soil Science, Vol 113, No 4, p 277-284, April 1972. 2 fig, 46 ref.

Descriptors: *Saline soils, *Saline water, *Water quality, *Irrigation water, *Salt tolerance, Environmental effects, Plant root systems, Soil water movement, Osmotic pressure, Soil water, Tension, Irrigation systems, Alkaline water, Alkaline

Souls. Identifiers: *Soil water potential, *Matric potential, *Exchangeable sodium percentage, *Sodium adsorption ratio.

A need exists for adequate, exacting criteria and standards for evaluating the sodicity, salinity and toxicity of waters for irrigation. Leaching is necessary for the prevention of soil salt accumulation but it does not entirely eliminate it. Salinity effects are generally more drastic in hot, dry climates. Proposed guidelines for permissible irrigation water salinity levels based on crop salt tolerance studies were derived under ideal, unrealistic field conditions. It has been suggested that root water absorption, from a soil of nonuniform salinity distributions, tends to approach uniformity in all soil strata. This is because osmotic and soil stresses vary inversely in these strata. Plant roots would thus absorb from different strata at different times vary inversely in these strata. Plant roots would thus absorb from different strata at different times following an irrigation. It follows that permissible irrigation water salinities may depend not only on crop tolerance but also on profile salinity distribution. After reviewing methods of evaluating water quality with respect to sodicity, it is concluded that it is presently impossible to set widely applicable standards of irrigation water quality. The ultimate method of assessing irrigation water quality awaits the ability to predict soil water composition and matric potential in both time and space and to interpret such information in terms of crop response under a variety of environmental variables. (Casey-Arizona)

EFFECT OF SALINITY ON POLLEN I. POLLEN VIABILITY AS ALTERED BY INCREASING OSMOTIC PRESSURE WITH NACL, MAGNESI-UM CHLORIDE, AND CALCIUM CHLORIDE, Kansas Agricultural Experiment Station, Manhat-

For primary bibliographic entry see Field 021. W72-12853

EFFECT OF CONSTANT SALINITY LEVELS ON WATER-USE EFFICIENCY OF BEAN AND COTTON,

Agricultural Research Service, Riverside, Calif. Salinity Lab.
G. J. Hoffman, and C. J. Phene.

American Society of Agricultural Engineers, Transactions, Vol. 14, No. 6, p 1103-1106, November-December 1971. 4 fig, 3 tab, 6 ref.

Descriptors: *Salinity, *Osmotic pressure, *Transpiration, *Leaves, *Plant growth, Laboratory tests, Cotton, Beans, Plant physiology, Turgidity, Environmental effects, Photosynthesis, Carbon dioxide, Respiration.

Identifiers: *Plant water potential, *Water-use effects.

Water-use efficiency is defined as the ratio of net carbon dioxide assimilation to transpiration (mg carbon dioxide/gm water). In arid and semiarid lands, salinity is an environmental factor that seems to affect crop water-use efficiencies. To determine the relative effects of salinity on net as-similation and transpiration, hourly measurements of net photosynthesis, respiration and transpira-tion were made on bean and cotton at 3 salinity levels in a microchamber where ambient temperalevels in a microchamber where ambient temperatures, dewpoint temperature, carbon dioxide concentration, photoperiod, light intensity, and air velocity were precisely controlled. Photosynthesis and transpiration decreased with increasing salinity levels while respiration increased. Water and osmotic potential measurements were also made on detached leaves and both decreased with increasing salinity. However, as measured by leaf turgidity, they fully adjusted to the root medium salinity except for cotton plants at -12.4 bar salinity. In the osmotically adjusted plants, calculation of the ratio of the difference in root and leaf water potentials to the transpiration rate indicated that plant resistance to water flow increased with potentials to the transpiration rate indicated that plant resistance to water flow increased with salinity. Water-use efficiencies remained essen-tially constant in beans and decreased with in-creasing salinity in cotton. (Casey-Arizona) W72-12856

3D. Conservation in Domestic and Municipal Use

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN

AREA, 1970, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 02E. W72-12430

URBAN WATER PLANNING-A BIBLIOG-

Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center. For primary bibliographic entry see Field 06B.

3E. Conservation in Industry

PUMPED-STORAGE POTENTIAL OF THE PACIFIC NORTHWEST, PARTS I, II, AND SUMMARY REPORT.
Corps of Engineers, Portland, Oreg. North Pacific

Corps of Engineers North Pacific Division Report, 2 Vol. January 1972. Vol 1 (Parts I and II) - 115 p, 27 fig, 5 tab, 272 ref. Vol 2 (Summary Report) - 18 p, 5 fig, 1 tab.

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3E—Conservation in Industry

Descriptors: *Electric powerplants, *Nuclear energy, *Pumped storage, *Projections, *Pacific west U.S., Peaking capacity, Sites, Coasts, Rivers, Water resources development, Ther-modynamics, Hydraulic structures.

Identifiers: *Pumped-storage potential, Peaking power.

Electric power resources are summarized for the Pacific Northwest. In the future, thermal-electric powerplants will carry the major part of the region's base load. There are 242 sites in western Washington, western Oregon, and along the Columbia River below Pasco, Washington, each of which has the capability of furnishing at least 1,000 megawatts of capacity on a daily/weekly operating cycle. These sites represent a total capacity potential of more than 650,000 megawatts. The peaking requirements of the region can be met until about 1990 by adding units at existing conventional hydroelectric projects. When the addition of those units is completed, other sources of peaking power must be developed. Of several alternatives available, one of the most promising is pumped storage. Part I presents a compilation of existing pumped-storage material updated to reflect current practices and price levels. Part II addresses the problem of integrating pumped storage into the Northwest Hydro-Thermal Power System, with emphasis on timing and the amount of pumped-storage generation that can be utilized. In load factor ranges of about 2% to 15%, pumped storage will provide a source of peaking capacity at a lower cost than any other available alternative. (Woodard-USGS) W72-12411

MISSOURI, LAND OF WATER,

S. C. Casteel.

Water and Sewage Works, Vol 119, No 7, p 68-72, July 1972, 4 fig. 3 ref.

Descriptors: *Water resources development, *Missouri, *Springs, *Dams, Hydroelectric *Dams, power, Flood control, Recreation, Water supply.

The natural supply of water is one of Missouri's most important natural assets. When Missouri was first settled, springs determined the location of numerous towns. Generally there was a grist mill at the larger springs. They served both as water supply and source of power. In addition to the 47 springs in five counties in an area known as the Big Spring Country there are 104 additional springs in Missouri with an average flow of over 1 cfs (646,000 gpd) located in 26 counties south of the Missouri River. A listing and description of some of these are presented. During the past three decades a number of multiple-purpose projects have been completed to control floods and generate electrical power. Prevention of about \$2.9 million flood losses has been attributed to the operation of this system. The Taum Sauk pumped storage hydroplant in the Ozark highlands near Lesterville, Mo., was completed in 1963. It has an output rating of 350,000 kilowatts. (Knapp-USGS)

ADVANCED NONTHERMALLY POLLUTING GAS TURBINES IN UTILITY APPLICATIONS. United Aircraft Research Labs., East Hartford, Conn.

For primary bibliographic entry see Field 05B. W72-12450

W72-12459

IN BWR'S, CORROSION CONTROL IS NON--CHEMICAL, General Electric Co., Schenectady, N.Y For primary bibliographic entry see Field 08G.

USE AND RE-USE OF WATER AND EF-FLUENTS IN THE MOTOR INDUSTRY-PART

For primary bibliographic entry see Field 05D.

USE AND RE-USE OF WATER AND EFFLUENTS IN THE MOTOR INDUSTRY-CO-NCLUSION, For primary bibliographic entry see Field 05D.

3F. Conservation in Agriculture

WATER USE EFFICIENCY IN PLANT GROWTH AND AMBIENT CARBON DIOXIDE

Texas A and M Univ., College Station. Water Resources Inst For primary bibliographic entry see Field 03B.

THE COMBINATION OF A SHORT TERM PUERARIA FALLOW, ZERO CULTIVATION AND FERTILIZER APPLICATION: ITS EFFECT ON A FOLLOWING MAIZE CROP, University of Science and Technology, Kumasi

A. Kannegieter.

Trop Agr (Ceylon). Vol 125, No 3, 4: p 77-94, 1969.

Identifiers: *Crop production, *Soil management, Crops, Cultivation, Fallow, Fertilizers, Ghana, Maize M, Pueraria D, Pueraria phaseoloides D.

Large scale tractor plowing was introduced in the forest zone and its fringes in Ghana, putting an abrupt end to the traditional system of natural soil regeneration under a shifting cultivation system. This produces a dire need for quick regeneration of soil fertility for providing a soil cover against in-solation, and erosion and for soil moisture conservation. A short term Pueraria fallow, combined with fertilizer application and 'zero cultivation' appeared to fill this need. The Pueraria phaseoloides formed within 3 mo. from sowing a complete soilcover. After 9 mo. it had built up 5 tons of dry matter per acre above ground, containing appreciable amounts of minerals even when not fertilized. When spray-killed, the Pueraria mass compacted into an unbroken mat close to the soil, providing effective soil protection, weed control and moisture-conservation in the following maize crop which was established in the undisturbed soil by punching holes through the 'dead' Pueraria mat. This in combination with fertilizer application to either the Pueraria fallow or later to the maize crop, resulted during the very unfavorable 1965 season in maize yields of around 2000 lbs. of dry grain/acre, about twice the average for the area in normal years.-Copyright 1972, Biological Abstracts, Inc. W72-12486

RESOURCE REAPPRAISAL AND RESISTANCE TO CHANGE: AN AUSTRALIAN EXAMPLE, University of New England, Armidale (Australia). J. J. J. Pigran Professional Geographer, Vol 24, No 2, p 132-136, May 1972. 1 fig, 10 ref.

Descriptors: *Semiarid climates, *River valleys, *Irrigation practices, *Regional development, *Social aspects, Environmental effects, Groundwater. Droughts. Grazing. Natural resources.

Foreign countries. Identifiers: *Environmental perception, *Social geography.

So pervasive and decisive are social perceptive processes that different populations, although occupying the same environment, may have literally different resources. Irrigation agriculture is an area in which perceptive man, equipped with technology, can reduce the rigidity of hitherto naturally imposed impediments to resource use The conflicts resulting from different perceptions of a given environment are illustrated by the semiarid Namoi Valley in northwestern New semiarid Namoi valley in northwestern New South Wales, where the newly-constructed Keepit Dam on the upper Namoi River has brought about perceptual changes in many, but by no means all, of the valley residents. The more reliable river flow has resulted in so much new irrigated agriculture that the cotton industry has grown from nothing a decade ago to a multimillion dollar business. However, many of the older residents of the valley have clung to their traditional outmoded perceptions of the regional resources being mainly for grazing and a little irrigated pasture. This has led to some conflict between the outmoded traditionalists who have not seen the wisdom and viability of long term agriculture and those with the new vision, especially during droughts when the grazier water was entirely taken by the irrigators. (Casey-Arizona) W72-12504

EFFECT OF IMPROVEMENT OF NUTRIENT SUPPLY AND SEEDLINGS GROWING ON RICE YIELD INCREASE IN HEAVY CLAYEY PADDY FIELDS.

yushu Agricultural Experiment Station (Japan). Kaoru Seino, Jikichi Ito, Nobuo Kosuge, Hidefumi Ito, and Tsutae Yamasaki.

Bull Hokuriku Agric Exp Sta. 11: p 25-80. 1970. Il-

lus. English summary.
Identifiers: *Crop production, *Clays, Fertilizing, Fields, Nutrients, Paddy M, Rice M, Seedlings.

Silicate nutrient fertilizer was applied at 4 ton/ha, and magnesium hydroxide at 0.8 ton/ha. Seedlings were planted in upland fashion with deep (30 cm) plowing, and irrigation water was drained from the period of determination of the number of bearing tillers to the ear formation stage. The integrated silicate fertilizer increased brown rice yields dur-ing 9 yr (1959-1968). The grain weight was consistently 6.3 ton/ha. The integrated nutrient supply was effective due to vigorous rooting power. The was effective use to vigorous footing power. The deep plowing experiments increased yields only in the first yr. Yields were decreased by deep plow-ing in following years due to lodging and possible derangement of soil nutrients. The highest average vields in one area for 9 vr were obtained with a combination of seedling raising, water management and deep plowing with integrated nutrients. In some cases the treatments were without effect. When the relative growth ratio of bearing tillers from transplanting to the period of determination was higher than that from the period of determination to maximum tillering, the rice yield increased. However, the reverse case was without effect. Rice yields increased when the ratio of N absorption to dry matter production was higher from the end of active tillering to the maximum tillering stage than the same ratio for a control field. Heavy dressing of these silicate materials for 8 yr in-creased the cation exchange capacity of heavy clayey paddy field soils. It also increased the oxidation-reduction potentials, decreased ferrous ions and humus, and increased the available silicate and easily reducible Mn. The combination of an integrated nutrient supply and well-timed N up-take produces a high yield of rice due to the promoted efficiency of absorbed N for grain production.—Copyright 1972, Biological Abstracts, W72-12507

ROTATING ACCESS TO WATER TO IMPROVE CATTLE SEMIDESERT RANGE

WATER, Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station. S. C. Martin, and D. E. Ward. Journal of Range Management, Vol 23, No 1, p 22-26, January 1970. 4 tab, 4 fig, 5 ref.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Agriculture—Group 3F

Descriptors: *Cattle, *Range management, *Water supply, *Pasture management, *Grazing, Arid lands, Water demand, Water conservation, Costs, Rotations, Xerophytes, Forage grasses, Vegetation, Crop production, Water utilization, Seasonal, Range grasses, Arizona. Identifiers: Santa Rita Experimental Range (Arizona), Semi-arid lands.

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Ranges may be overgrazed even if properly stocked because most semiarid grass-shrub cattle ranges are grazed yearlong. Fencing, which helps control overgrazing by deferred rotation, may be too costly on many southwestern ranges. This study determines whether cattle in a pasture with several watering places could be made to rotate their use of forage near water by opening one water place at a time, and determines changes in cover, production and use of perennial grasses near water under such a system. Seasonal opening and closing of watering places in a 3,200-acre pasture on the Santa Rita Experimental Range in Arizona showed lighter use of perennial grasses near water if utilization for pasture was moderate to light, and if the closed period included the summer growing season. Rotating use of watering places works best in large range units with waters far apart. (Popkin-Arizona)

ON THE MEDITERRANEAN CLIMATIC REGIME OF WEST PAKISTAN, Institut Francais, Pondichery (India). For primary bibliographic entry see Field 02B. W72-12510

EVAPORATION LOSS NOW REPORTED DAI-

LY, National Weather Service, Lubbock, Tex. O. Newton, and O. Wilke. The Cross Section, Vol 18, No 5, p 1-2, May 1972.

Descriptors: *Water management (Applied), *Irrigation practices, *Evaporation, *Water loss, *Irrigation programs, Evaporation pans, Crop production, Water conservation, Soil moisture, Soil-water-plant relationships.

Identifiers: Texas South Plains, Nomographs.

A new management tool for Texas South Plains ir-rigation farmers is available in daily evaporation reports of the National Weather Service. Five lo-cations in the area report surface water evaporacations in the area report surface water evapora-tion every 24 hours, results are averaged and re-ported by media outlets. A high correlation exists between water loss from pans and crops which al-lows for better water conservation and manage-ment. Effects of soil moisture, crop type and ir-rigation-practice are discussed. An irrigation scheduling nomograph is given which requires an input of the number of inches of pan evaporation since the last irrigation, and gives the days to the next irrigation. An example is provided. (Popkin-Arizona) W72-12515

PREDICTION OF IRRIGATION ADVANCE FUNCTION BY DIMENSIONAL ANALYSIS, Indian Inst. of Tech., Kharagpur. Dept. of Agricul-

Hudai first. Of Refriction and Drainage Division, American Society of Civil Engineers, Proceedings, Vol 98, No IR2, p 247-253, June 1972. 2 fig, 12 ref.

Descriptors: *Irrigation, *Dimensional analysis, *Computers, *Field capacity, Mathematical studies, Hydraulic conductivity, Forecasting, Inflow, Soil types, Infiltration, Soil water movement.

One of the important factors in the design of a sur-face irrigation system is the prediction of the ad-vance distance-time relationship when estimating

in advance for a given entrance stream size and land surface slope under given soil bed infiltration characteristics variation. An attempt has been made to derive an advance equation by dimen-sional analysis of the fundamental variables involved in water advance phenomena. Dominant variables considered include distance of advance, variables considered include distance of advance, clapsed time, inflow stream per unit top width of flow, slope of soil bed, acceleration due to gravity, expons. in the Kostiakov type accumulated infinitation i.nction, hydraulic conductivity of soil bed and absolute roughness of the bed. With available field data, the derived equation was tested and found satisfactory. Using the proposed technique, a general equation can be derived with suitable experimentation. (Casey-Arizona) W72-12518

IS DRIP IRRIGATION FOR ARIZONA, Arizona Agricultural Experiment Station, Tucson. D. D. Fangmeier. Progressive Agriculture in Arizona, Vol 24, No 8, p 6-7, May-June 1972. 3 fig, 2 ref.

Descriptors: *Irrigation practices, *Irrigation design, *Crop production, *Water conservation, *Water costs, Water supply, Irrigation water, Arizona, Irrigation efficiency, Labor, Surface irrigation, Water conveyance, Discharge (Water), Pumping, Filters, Valves, Pipelines, Fruit crops, Trees, Water control, Root zone, Salts, Economics, Tailwater, Runoff, Consumptive use, Capital risks.

Identifiers: *Trickle irrigation.

Decreasing availability and rising labor and water costs are causing growers to consider replacing surface irrigation by drip systems. Drip systems deliver water to the vicinity of a plant where discharge is controlled by an emitter. Systems consist of a pump, filters, meter, control valves, pipe and emitters. Fruit trees are best suited to drip systems as extensive pipe networks are required. Drip irrigation provides better water control where only the actual root-soil volume is watered. Additional water may be required to remove accumulated salts. Systems cost from \$150 to \$500 per lated salts. Systems cost from \$150 to \$500 per acre and are economical for high value crops. Tailwater runoff is eliminated. A 95% water savings water runoft is eliminated. A 50% water savings occurred on young trees compared to adjacent surface irrigated trees. Water savings from 20 to 50 percent on mature trees are estimated. Consumptive use requirements, labor savings, emitter designs and irrigation equipment are discussed. Drip systems are useful in Arizona where there are high value crops, high water and labor costs, limited water supply available capital and a willingness to overcome uncertainties involved. (Popkin-Arizona) W72-12519

SOME NOTES ON WATER SUPPLY IN SOUTH

INDIA, West Midlands Coll. of Education, Walsall (En-

west Midands Coll. of Education, warsail (England). Dept. of Geography. W. Wilde. Scottish Geographical Magazine, Vol 88, No 2, p 61-66, April 1972. 2 fig, 3 tab, 6 ref.

Descriptors: *Irrigation practices, *Agronomy, *Foreign lands, *Rice, Farm management, Irriga-tion systems, Water supply, Drainage, Evapotranspiration.

There are about 700,000 villages in India whose daily survival depends upon water supplies. The most efficient uses of water in that country depend most efficient uses of water in that country depend not so much on total land area irrigated as on the timeliness of irrigation scheduling. This is illustrated by descriptions of 2 villages, Orakkadu, a small, low-lying coastal village of 636 people and the larger inland village of Kamayagoundampati, with 8,294 people. In Orakkadu, about 168 of the 208 cropped acres are irrigated. Wells are present but the main water source is a nearby reservoir. Fortunately the local landlord is progressive, charging for tubewell water on a volume rather than an acreage basis, which induces more efficient usage. He has also introduced newer varieties of rice, chemical sprays, fertilizers, and tractors. In Kamayagoundanpatti, which is Cumbum Valley, rice accounts for about 1/2 of the 2093 irrigated acres. About 73% of the land holdings are under 5 acres and 12.5% are less than 1 acre. A minority of the tenant farmers still use wild flooding irrigation methods, which are extremely inefficient in this region of high evapotranspiration. Drainage has also been neglected with a consequent soil salinity buildup. Nevertheless, it is felt that there is occurring a slow awakening to modern agricultural methods in India's villages. (Casey-Arizona)

PREDICTIONS OF AGRICULTURAL IRRIGA-TION FOR INDIANA AND IRRIGATION POTENTIALS OF SELECTED INDIANA SOIL SERIES, Indiana State Dept. of Natural Resources, Indi-

K. Kemp. State of Indiana, Department of Natural Resources, 238 p, 1970. 11 tab, 4 fig, 71 ref.

Descriptors: *Water requirements, *Water policy, *Water management (Applied), *Irrigation water, *Forecasting, *Indiana, Consumptive use, Soil series, Agriculture, Economic prediction, Climate, Water demand, Water resources development.

This report shows predictions of the quantities of water required to support agricultural irrigation in 92 Indiana counties and 9 economic areas in 1980, 1990, 2000, 2010, 2020. Predictions are based on historical information, and were developed to help manage the state's water resources as a result of the state water plan. Soil series and location, cli-mate and future water demands are discussed. Agricultural irrigation water required for the state in 1980, 1990, 2000, 2010, and 2020 are about 39,100, 48,300, 58,000, 67,800, and 77,600 acrefoot respectively. Many small maps and tables present water-consumption predictions. (Popkin-Arizona) W72-12524

EFFECTS OF NITROGEN SOURCE AND PHOSPHORUS ON CRESTED WHEATGRASS GROWTH AND WATER USE, Agricultural Research Service, Mandan, N. Dak.

Northern Great Plains Research Center.

J. F. Power, and J. Alessi.

Journal of Range Management, Vol 23, No 3, p. 175-178, May 1970. 2 tab, 2 fig, 6 ref.

Descriptors: "Nitrogen, "Phosphorus, "Wheat-grass, "Water utilization, Effects, Forages, Soil-water-plant relationships, Grasslands, Crop production, Livestock, Efficiencies, Plant growth regulators, Ammonium compounds, Calcium com-pounds, Ureas, Fertilization, Crop response, Precipitation, Correlation analysis. Identifiers: Dry matter production.

Grassland production must increase to satisfy pro-Orassiand production must increase to sausty projected demands for livestock products. This project obtained information on the relative efficiencies of various nitrogen (N) sources at several rates of annual application. Effects of four N sources upon crested wheatgrass growth were studied for 5 years at Mandan, North Dakota. Amdied for 5 years at Mandan, North Dakota. Ammonium nitrate, ammonium sulfate, Calcium nitrate and urea were applied annually at rates up to 160 lb N/acre with and without phosphorus (Pertilization. Dry matter production was increased by N and P fertilization in all years. Higher N rate and N source influenced yields only in years of higher production. Responses to N fertilization increased by about 380 and 490 lbs for each acreate interest in the product of the produ inch increase in water supply above 5 inches with

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation in Agriculture

and without P, respectively. Response to P fertilization was about 50 lb/acre-inch regardless of water supply. Dry matter production and N-fer-tilization response were closely correlated with May precipitation, with a correlation coefficient of 0.89. (Popkin-Arizona) W72-12525

WATER USE IN RELATION TO MANAGE-MENT OF BLUE PANICGRASS,

Agricultural Research Service, Tucson, Ariz. Crops Research Div.; and Arizona Univ., Tucson.

Dept. of Agronomy.
L. N. Wright, and A. K. Dobrenz.
Journal of Range Management, Vol 23, No 3, p
193-196, May 1970. 3 tab, 10 ref.

Descriptors: *Water utilization, *Crop production, *Soil-water-plant relationships, *Forages, *Farm management, Efficiencies, Range grasses, Treatment, Moisture stress, Plant growth, Proteins, Weight, Water management (Applied).

Water use efficiency was determined for field grown blue panicgrass. Treatments were soilmoisture stress, clipping height and maturity stage. Water-use efficiency is the number of Kg of water per Kg of forage dry-weight produced. Panicgrass had a broad tolerance to high moisture stress. Efficient use of water and root weight decreased when stress increased, while dry weight was unchanged. The 30-cm clipping height was most efficient in water use, as it gave the highest forage production and produced the highest percentage protein and most roots. The most efficient use of water, the highest forage production and the highest protein percentage were obtained from the same management treatment. This is contrary to the per-formance of some crops. (Popkin-Arizona)

ENERGY EXCHANGES BETWEEN A PASTURE AND THE ATMOSPHERE UNDER STEADY AND NON-STEADY-STATE CONDITIONS, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). For primary bibliographic entry see Field 02I. W72-12528

RADIOISOTOPE UPTAKE BY SELECTED RANGE FORAGE AND WEED SPECIES. Agricultural Research Service, Reno, Nev. Crops Research Div For primary bibliographic entry see Field 04A. W72-12532

SOIL MOISTURE, FORAGE, AND BEEF PRODUCTION BENEFITS FROM GAMBEL OAK CONTROL IN SOUTHWESTERN COLORADO, Colorado State Univ., Hesperus, San Juan Basin

Branch Station. For primary bibliographic entry see Field 04A.

GRAZING EFFECTS ON RUNOFF AND VEGETATION ON WESTERN SOUTH DAKOTA

W72-12534

RANGELAND, Agricultural Research Service, Newell, S. Dak. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 04C. W72-12536

A COMPARATIVE STUDY OF THE DEVELOP-MENT OF YOUNG TEA UNDER IRRIGATION: II. CONTINUED GROWTH IN THE FIELD, La Trobe Univ., Bundoora (Australia). School of Agriculture.

Trop Agric. Vol 48, No 3, p 271-277, 1971. Illus.

Identifiers: *Irrigation effects, *Crop response, Development, Fields, Growth, Irrigation, Lateral, Roots, Tea D.

Root growth, both in depth and lateral spread, was better with irrigation than without after a period of 20 mo. in the field. Four different types of planting material were used and no differences in lateral spread were significant. Top growth, measured both as pruning weight or area or cross-section of stem, showed significant increases due to irrigastem, snowed against an increases due to miga-tion, but when planting material was being con-sidered only pruning weight was significant.— Copyright 1972, Biological Abstracts, Inc. W72-12711

HYDROLOGIC BUDGET OF THE POUDRE VALLEY, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. For primary bibliographic entry see Field 02A. W72-12822

THE SNOWY MOUNTAINS HYDROELECTRIC AND IRRIGATION SCHEME (AUSTRALIA), For primary bibliographic entry see Field 04A.

AN AGROCLIMATIC PROBABILITY STUDY OF THE ECONOMICS OF FALLOW-SEEDED AND CONTINUOUS SPRING WHEAT IN SOUTHERN SASKATCHEWAN, Department of Agriculture, Ottawa (Ontario). Plant Research Inst.

Agricultural Meteorology, Vol 9, No 5/6, p 305-321, March 1972. 5 fig, 8 tab, 20 ref.

Descriptors: *Wheat, *Model studies, *Soil moisture, *Fallowing, *Economic prediction, Evapotranspiration, Spring, Probability, Agroclimatology, Agronomic crops.
Identifiers: *Potential evapotranspiration.

There is a remarkable similarity in the response of grain yields to the total available soil moisture from storage and seasonal rainfall over much of the Canadian prairies and the Great Plains of the U.S. A regression-type model for estimating daily potential evapotranspiration (PE) was used to synthesize probable wheat yield from observed growing season evapotranspiration and estimated spring soil moisture. The intent was to show the utility of spring soil moisture estimates from a water-budgeting model in order to assess the economics of wheat-fallow rotation practices. The spring soil moisture estimates were significantly correlated with the appropriate observations on fallow and on stubble lands. Using estimated yields from continuous wheat and 2-year rotation fallow wheat, and the average farm wheat price per bushel, annual net returns were estimated for continuous wheat at 13.23 dollars per acre com-pared to 9.53 dollars per acre for fallow wheat. However, fluctuations in probable net returns were great for continuous wheat. Advantages of wheat fallowing and the efficacy of the evaluation ethod are discussed. (Casey-Arizona) W72-12835

CROPPING PATTERNS IN WEST PAKISTAN, Indiana State Univ., Terre Haute. Dept. of Geography. A. H. Siddiqi.

Journal of Geography, Vol 71, No 2, p 96-108, February 1972. 7 fig, 1 tab, 7 ref.

Descriptors: Foreign countries, *Crop response, *Irrigation practices, *Arid lands, River basins, Agronomic crops, Saline soils, Cereal crops, *Regional analysis, Geographical regions, Mapping. Identifiers: *Subsistence crops, *Pakistan, *Crop combination areas.

West Pakistan's agricultural system consists of intensively operated subsistence farms where only a small percentage of the total crop area is devoted to cash crops. About 3/4 of the nation's land area is not arable because of such environmental problems as poor and salty soils and lack of water resources due to the arid climate. Most of the araresources due to the and climate. Most of the arrivable land is in the Indus Valley, where over 70% of it is irrigated annually. This study focuses on regional variations in national cropping patterns by establishing crop-combination areas. This serves to uncover land use distinctions between regions. The country is mainly a producer of cereal and fodder crops. The cultivation of crops in each crop combination reflects a balance between the demands of soil moisture and crop-water needs. Changes in cropland use may result from such negative factors as waterlogging, salinization, overcropping, or such positive factors as response to organizational and input improvements. (Casey-W72-12842

QUALITY OF SURFACE IRRIGATION RU-NOFF WATER,

Agricultural Research Service, Kimberly, Idaho. Snake River Research Center.
For primary bibliographic entry see Field 05G.
W72-12845

CITRUS VS. WEATHER: A BRIEF HISTORY, R. Rock.

Citrograph, Vol. 56, No. 3, p 71-72, 80-82, January

Descriptors: *Weather data, *Weather patterns, **Crop production, **Citrus fruits, **Farm practices, Marketing, Storms, Costs, Droughts, Freezing, Hurricanes, Floods, Seasonal, Rainfall, **California, Florida, Texas, Arizona, Europe.

Past weather conditions should be related to producing California citrus with respect to crop yield and market supply. A brief summary is pro-vided of weather conditions in California, Florida and Texas which have affected citrus production and economics during the last 75 years. Freezes and storms best remembered by citrus growers fall in two categories—the ones which cost them money in lost fruit and the ones which made them money because of someone else's misfortune. Innumber occause or someone else's misfortune. In-cluded are summaries of relevant information in Arizona and Europe. Emphasis is on drought, freezes, hurricanes, flooding, mildness of season, rainfall and fruiting policy. (Popkin-Arizona) W72-12849

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THE DROUGHT OF 1886,

J. Lackey. The Ranch Magazine, Vol. 51, No. 5, p 16-17,21, February 1971. 3 fig.

Descriptors: *Droughts, History, *Crop production, *Texas, Winter, Corn, Harvesting, Cotton, Grains (Crops), Wells, Rivers.

History of drought is reviewed in West Texas because of the impact of the winter 70-71 drought. Drought was so severe in 1886 that all types of crops dried up; not a single bushel of corn per acre was harvested, cotton did not average a half a bale was narvested, cotton did not average a nair a baie to ten acres, and small grains did not yield. Wells in towns went dry and there was not water in creeks. Quotations from Texas papers are used to describe the 1886 drought in West Texas commu-nities. (Popkin-Arizona) W72-12854

SUBIRRIGATION-A COMING INNOVATION. The Cross Section, Vol. 17, No. 6, p 2-3, June 1971.5 fig, 2 ref.

*Subsurface irrigation, *Farm Descriptors: management, *Irrigation practices, *Irrigation ef-

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Agriculture—Group 3F

ficiency, *Water management (Applied), Water conservation, Groundwater mining, Texas, Water table, Runoff, Weed control, Labor, Fertilization, Crop production, Maintenance, Alkalinity, Salini-ty, Water costs, Plastic pipes, Orifices, Spatial dis-tribution. Identifiers: Capillary action.

Withdrawal of water from the Ogallala Formation in the Texas High Plains is actually a mining operation. As the water table goes down, interest in conservation of underground water goes up. Subirrigation is a new farming practice that may result in greater savings of water. Advantages of subirrigation include elimination of runoff problem, reduction in weed problems, increase fertilization methods, and increase in maturing of crops. Disadvantages include possible maintenance, alkalinity and salinity problems. There are high initial costs. Most designs include plastic pipes for economy and maintenance. Orifice designs, spacing and capillarity are discussed. Subsurface irrigation requires small labor costs. Subirrigation is a promising experimental method of irrigation water conservation. (Popkin-Arizona)

AVOID SPRINKLING PUBLIC ROADS.

The Cross Section, Vol. 17, No. 6, p 1-2, June 1971.

Descriptors: *Sprinkler irrigation, *Roads, *Water conservation, *Irrigation efficiency, *Irrigation practices, Groundwater, Water supply, Water costs, Public lands, Hazards, Regulation, Irrigation water, Texas.

Identifiers: Texas High Plains, High Plains Underground Water Conservation District No. 1

Sprinkler irrigation systems are most efficient in numerous areas of the Texas High Plains. Sprinklers meeting individual requirements include handmove, tow lines, boom or giant sprinklers, side or wheel roll, side move with and without trailer line, center pivot self-propelled, straight lateral self-propelled, traveler or big gun, and solid set systems. Sprinklers are good for conservation of groundwater and water supply; they aid in saving money for irrigators. Sprinklers used close to public roads waste water and present bazards to ing money for irrigators. Sprinklers used close to public roads waste water and present hazards to motorists, school buses and mail carriers. Irrigation water leaving the farm to a public road is in violation of the statutes of Texas and regulations of the High Plains Underground Water Conservation District No. 1. A metal shield or a sprinkler head which turns only 180 degrees can be employed to prevent 'irrigating' a public road. (Popkin-Arizona)
W72-12860

IRRIGATION INVENTORY, High Plains Underground Water Conservation District No. 1, Lubbock, Tex. A. W. Sechrist.

The Cross Section, Vol. 17, No. 6, p 4, June 1971. 3 tab, 1 ref.

Descriptors: *Irrigated land, *Groundwater min-ing, *Irrigation efficiency, *Crop production, *Surveys, Irrigation wells, Texas, Water conser-vation, Soil-water-plant relationships. Identifiers: Ogallala Aquifer, Texas Water Development Board.

An accurate accounting of irrigation and irrigated crops is a basic need of many agriculturalists. Various records are maintained in partial answer to these needs. The Texas Water Development Board issues inventories based on the work of numerous cooperating agencies. A summary of the irrigation inventory is presented for 1958, 1964 and 1968 for 15 West Texas Counties, including acres irrigated, acre-feet used, number of irrigation

wells, quantity of water per acre irrigated and quantity of water pumped per well. Results of a 1969 survey (acres irrigated and number of irrigation wells) are presented for the 15 counties. Depletion data for these counties in West Texas are also presented, showing a volume of 2,283,605 acre-feet mined from the Ogallala Aquifer. (Poplin Arigonia) kin-Arizona) W72-12861

AGROMETEOROLOGICAL INVESTIGATIONS OF HEAT BALANCE AND WATER BALANCE IN AGRICULTURAL FIELDS: II. COMPONENTS OF THE WATER BALANCE, Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).

W. Mueller.

W. Mueller.

W. Meteorol Geophys Bioklimatol Ser B. Kli-

W. Mueller.

Arch Meteorol Geophys Bioklimatol Ser B Klimatol Bioklimatol Strahlungsforsch Climatol Bioclimatol Radiat Res. Vol 19, No 2, p 199-224.
1971. Illus. English summary.
Identifiers: Agriculture, *Water balance, *On-site investigations, Germany, Heat, Marchfeld (Germany), Meteorology, Moisture, Soils.

Results are discussed of observations of the components of the water balance: precipitation, evaporation, dew, duration of humectation, soil moisture, and groundwater during a 5 yr period from the Marchfeld-area (Obersiebenbrunn).—Copyright 1972, Biological Abstracts, Inc.

WATER UPTAKE BY COTTON ROOTS DUR-ING AN IRRIGATION CYCLE, Alabama Agricultural Experiment Station, Au-

H. M. Taylor, and B. Klepper. Aust J Biol Sci. Vol 24, No 5: p 853-859. 1971. II-

Identifiers: *Cotton D, *Irrigation effects, *Root systems, Moisture uptake.

Two-month-old cotton plants, growing in a rhizotron compartment filled with loamy fine sand surface soil, were subjected to an irrigation cycle. Estimates of rooting density, soil water content, soil water potential, water extraction per unit length of root, plant height, and leaf water potential were made throughout this cycle. The soil dried progressively from top to bottom. Water extraction per unit length of root was greater in wetter soils and decreased exponentially with soil water potential. In general, deep roots were as effective as shallow roots in water extraction. Rootrective as shallow roots in water extraction. Rooting intensity was greater in the upper soil at first, but became uniform later. After irrigation, water extraction per unit length of root was about the same at all depths.—Copyright 1972, Biological Abstracts. stracts, Inc. W72-12893

SPRINKLING IRRIGATION CONDITIONS FOR COTTON IN THE REGION OF THE STATE IRRIGATION SYSTEM-STARA ZAGORA, Academy of Agricultural Sciences, Stara Zagora (Bulgaria). Experiment Station of Irrigated Agriculture.

G. Hristov.

Rastenievod Nauki. Vol 7, No 9: p 45-60, 1970. Il-

lus. English summary.
Identifiers: Bulgaria, *Cotton D, Irrigation practices, *Sprinkler irrigation, Stara-Zagora.

During the period prior to inflorescence and fruit formation, border irrigation should be maintained so that the pre-irrigation soil moisture at a depth of 0.80 m is over 80-80% of the field capacity. This level was maintained by 2-3 irrigations at 750-800 m3/ha water applied from July 10-Aug. 10. Sprinkling during the period prior to inflorescence should be applied 2-4 times, depending on the amount of rainfall. Application of 500 m3/ha water should maintain the field capacity of the soil at 80-

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80% to a depth of 0.50 m. During the periods of emergence-inflorescence and florescence-fruit formation, 3-6 sprinkler irrigations annually at 350 and 270 m3/ha should be applied, depending on the rainfall, to maintain a pre-irrigating moisture level of 80-85% of the field capacity to a 0.35 m depth... Copyright 1972, Biological Abstracts, Inc. W72-12894

THE SURVIVAL OF ALFALFA UNDER IR-RIGATION CONDITIONS, Academy of Agricultural Sciences, Pazardzik (Bulgaria). Experiment Station of Irrigated Agriculture. M. Sarkizov, and L. Delcev. Rastenievod Nauki. Vol 7, No 9: p 35-43, 1970. Il-

Identifiers: Crop response, *Crop production, *Alfalfa D, Corn M, Hay, Irrigation, Rotation, Survival, Wheat M.

Research was done at the irrigated Station for Agricultural Experiments at Pazardzik, on channelled forest soil, from 1960-1967. The test included types that lasted for 2, 3, 4 and 5 yr. These same types were tested in spring, summer, and autumn sowings. In aging, the alfalfa gradually loses its vitality, its potency and its ability to germinate. The hay yields are highest during the second yr, when the alfalfa attains its maximum growth and development. Good results are also obtained with alfalfa lasting 3-4 years, depending on the care with which the sowing is managed. From the fifth yr, the productivity of the alfalfa lowers suddenly, due to the rapid thinning out of the seedlings. The most rational effort would be to cultivate the alfalfa in the same field for 3-4 consecutive yr. The larfa in the same field for 3-4 consecutive yr. The largest amount of root mass is found in the tillable layer (0-30 cm) after the third yr of alfalfa exploitation. The best production following crop rotation would be when corn and wheat are cultivated after 3-4 yr of affalfa, when the total production and net yield per hoctare are the highest.--Copyright 1972, Biological Abstracts, Inc.

THE EFFECTS OF SEVERITY OF DEFOLIA-TION AND SOIL MOISTURE STRESS ON DESMODIUM INTORTUM, Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Tropi-

cal Pastures. B. C. Imrie.

Aust J Exp Agric Anim Husb. Vol 11, No 52: p

521-524.1971.
Identifiers: *Crop response, *Defoliation, Desmodium intortum D, *Moisture stress, Soils, Crop production.

The responses of 5 introductions and 1 cultivar of Desmodium intortum to 2 defoliation intensities Desmodium intortum to 2 defoliation intensities under stress and nonstress soil moisture regimes were studied in a pot experiment. Both defoliation and moisture stress reduced yield. Significant line x defoliation interactions occurred, including differences among the component lines of the cultivar 'Greenleaf.' Evidence was found that genetic shift has occurred in Greenleaf in the direction of the lower yielding components which were more adversely affected by severe defoliation. The wisdom of releasing mixtures of 'pure' lines as commercial varieties of perennial pasture species is questioned.—Copyright 1972, Biological Abstracts, Inc.

EFFECT OF VARIOUS TREATMENTS ON HARDENING AND SOFTENING OF SEEDS IN PODS OF BARREL MEDIC (MEDICAGO TRUN-

CATULA, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.

R. Kirchner, and W. D. Andrew.

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Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation in Agriculture

Aust J Exp Agric Anim Husb. Vol 11, No 52: p 536-540, 1971. Illus.

Identifiers: *Seed treatment, *On-site investigations, Australia, Barrel medic, Hardening, Medicago truncatula D, Pods, Rainfall, Seeds,

Experiments to determine ways of softening seeds in the field were designed to maintain stands of barrel medic (Medicago truncatula). Under moist barrel meate (medicago runcatura). Onder most temperate conditions, at Canberra, seeds in pods above ground readily hardended during Dec. but none softened duringthe following 2 mo. At Coonamble, under hotter conditions and with less rainfall, approximately 13% of the hard seeds in pods above ground softened during the summer but 96% of pods contained at least one soft seed. Covering the pods with about 1 in. of soil early in Dec. greatly increased softening of their seeds both at Canberra and Coonamble, but the response to seed burial was seen at Coonamble only after 134 days. Holding pods in a hot humid atmosphere also hastened seed softening. In all experiments, seed softening in pods began at the peduncle end and proceeded along the spiral as time went on. A method of determining intensity of hard-seededness is described. Although the method is arbitrary it indicated a reduction in intensity of hardseededness preceding softening of the seed.--Copyright 1972, Biological Abstracts, Inc.

FORAGE PRODUCTION OF SORGHUM VARIETIES IN RELATION TO DIFFERENT LEVELS OF NITROGEN, Central Arid Zone Research Inst., Jodhpur (India).

S. D. Singh, D. K. Misra, D. L. Vyas, and H. S. Daulay

Indian J Agric Sci. Vol 41, No 3: p 216-220, 1971.

Identifiers: Forages, *Nitrogen, *Crop produc-tion, Rainfall, Sorghum M, Varieties, Fertiliza-

The 'Sojat Bavni' cultivar of sorghum was superior to 'RS 610,' 'Local Pali' and 'NK 210,' but was similar to 'Meta Type' in forage yield. The low stem:leaf ratio of 'Sojat Bavni' (3.5) indicates its palatability and consequent suitability for forage more than 'Merta Type,' which has a stem:leaf ratio of 7.5. The yield of green forage increased with increasing N levels, N at 53.7 kg/ha was optimum for 'Sojat Bavni.' Seasonal changes occurred in varietal performance and response to N, perhaps owing to the differential rainfall distribution during the growing season. The response to N increased at the normal rainfall, but decreased with high rainfall.--Copyright 1972, Biological Ab-W72-12899

RELATION OF WEATHER TO THE IN-FLUENCE OF HAY CROPS ON SUBSEQUENT CORN YIELDS ON A CHALMERS SILT LOAM. Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.

Agron J. Vol 64, No 1: p 8-10, 1972. Illus.
Identifiers: *Crop production, *Rotations, Alfalfa
D, Brome grass, Bromus inermis M, Corn M, Crops, Grass M, Hay, Loam, Medicago sativa D, Silts, Weather, Zea mays M.

The effect of hav crops (alfalfa (Medicago sativa L.), bromegrass (Bromus inermus L.), and a mixture of the two) on soil productivity as measured by corn (Zea mays L.) yields was investigated in field experiments conducted from 1952 to 1969. Corn following hay yielded more than corn following corn. The greater the number of years of corn subsequent to hay, the lower the corn yield. There was a negative linear correlation between corn yield and log of year of corn subsequent to hay. The slope of this relation varied with year and was correlated with 8-wk precipitation and 4-wk degree days following corn planting. The slope was greater as precipitation decreased below 15 cm or increased above 20 cm and also as degree days increased.—Copyright 1972, Biological Abstracts, W72-12900

EFFECTS OF FERTILIZATION AND IRRIGA-TION ON CORN YIELDS, P CONTENT OF CORN LEAVES, AND AVAILABLE P IN SOIL, Virginia Polytechnic Inst., and State Univ.,

Blacksburg. J. A. Lutz, Jr., G. D. Jones, P. H. Hoepner, H. C. Porter, and D. C. Martens.

Commun Soil Sci Plant Anal. Vol 2, No 6: p 449-

Identifiers: Corn M, *Fertilization, *Irrigation effects, Leaves, Phosphorus, Silage, Soils, Crop production, Grains (Crops).

Experiments were conducted on Congaree loam at Orange, Virginia, in 1963, 1964, and 1965 to measure the response of corn to irrigation and to 3 levels of P. Rate of N was 140 kg/ha. Levels of P were 0, 37.5, and 75 kg/ha; while the rate of K was 70 kg/ha. All micronutrients were applied in recommended amounts. Excellent corn silage and grain vields were obtained and there was no response to added P except for grain yields on irrigated plots. Cropping with corn, irrigation, and fertilization appeared to have little effect on the P content of the 0- to 15-cm soil layer. Irrigation and P fertilization did not affect the P content of the corn leaves. Fractionation of P indicated appreciable amounts of Al-P, Fe-P, and Ca-P to a depth of 140 cm with less Al-P than the other forms. Moisture extraction by the corn, as measured with Bouyoucos blocks, indicated that the corn was utilizing moisture to a depth of 120 cm during siling and tasseling. The corn roots, therefore, had access to appreciable amounts of P below the)- to 15-cm soil depth. Since there was essentially no change in the P content of the O- to 15-cm soil depth, the corn apparently was either utilizing most of its P from soil depths below 15 cm, or available P was being maintained at a fairly constant amount from the various forms in which it was found in the soil. This is in contrast to the usual situation in which plants utilize appreciable amounts of P from the O- to 15-cm soil depth,--Copyright 1972, Biological Abstracts, Inc.

WHEAT PROTEIN PREDICTION FROM CLI-MATIC FACTORS IN SOUTHERN NEW SOUTH WALES.

Agricultural Research Inst., Wagga Wagga (Australia). Dept. of Agriculture. A. C. Taylor, and A. R. Gilmour.

Aust J Exp Agric Anim Husb. Vol 11, No 52: p 546-547, 1971.

Identifiers: Climatic data, New South Wales, *Forecasting, *Proteins, *Wheat M, Temperature.

Association between regional wheat protein levels and numerous rainfall, temperature, and sowing time variables in southern New South Wales over the period 1948-49 to 1968-69 was assessed from simple linear correlation coefficients. Of all the simple variables, average maximum temperatures in Oct. and Nov. were most highly correlated (positively) with protein. On the basis of the preliminary assessment, a small number of com-bined rainfall and temperature variables were built up for screening through a series of multiple regression analyses. The best of the multiple regression models took in a further variable, time (in years), to take account of the factors not covered by the other variables. This model ac-counted for more than 85% of regional protein variation over 21 yr and included 3 highly significant variables (P < 0.01): time (in years), midseason (May to July) rainfall, and late (Aug. to Nov.) rainfall and one significant variable (P < 0.05): midseason rainfall squared. Protein level increased by approximately 0.1% per annum over the study period once significant climatic effects were removed.—Copyright 1972, Biological Ab-

SOIL TEMPERATURE, PHOSPHORUS EFFECTS WATER, AND UPON BARLEY

GROWTH, Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center. R. F. Follett, and G. A. Reichman.

Agron J. Vol 64, No 1: p 36-39, 1972. Illus. Identifiers: *Soil-water-plant relationships, *Crop production, Barley M, Fertility, Plant growth, Hordeum vulgare M, Phosphorus, Soils, Tempera-

Barley (Hordeum vulgare L.) growth in the northern Great Plains is often limited by soil water, soil temperature, or soil fertility. Therefore the response of 'Sacramento' spring barley to 3 levels each of soil temperature (T), water (W), and P fertility (P) was investigated in a growth chamber. The yield of oven-dry tops, crowns, and roots showed the beneficial effects of increased W and P on barley growth for all soil temperatures studied. Response of top and crown weight to added P declined as T increased or W decreased. Crown weight was highly correlated with numbers of tiller plus root buds initiated at the crown. The addition of P increased the numbers of tiller and root buds. Low available water and high soil tem-perature decreased the number of root buds per tiller bud. When low W limited barley growth, root weights were maintained in preference to top weight, and top weight in preference to crown weight. Where the fertilizer needs to barley have been met, methods devised to conserve water and control soil temperature at or slightly below optimum near developing root systems should favor yield responses.—Copyright 1972, Biological Ab-W72-12903

OAT VARIETY TRIALS IN HEDMARK AND OPPLAND 1962-1968,

S. Frogner.

Forsk Fors Landbruket. Vol 20, No 5: p 495-511.

1969. English summary. Identifiers: *Crop production, *Oats, Hedmark, Oppland, Trials, Varieties, Weather, Grains (Crops).

Several foreign and Norwegian varieties and lines were tested, of which the 16 locally most pertinent are dealt with. The location of the trial plots, the experimental design, fertilizers used, the varieties tested, together with soil classification and the most important meteorological data are described. Yield and agronomic data for oat varieties grown at the State Agricultural Experiment Station Moystad are presented. As to grain quality, the influence of weather conditions on hull percentage, kernel size and volume weight is also treated.— Copyright 1972, Biological Abstracts, Inc.

UNIFORMITY OF WATER APPLICATION FROM REVOLVING HEAD-SPRINKLER.

Central Arid Zone Research Inst., Jodhpur (India). Wasi Ullah, C. P. Mathur, and S. D. Singh. Inidan J Agric Sci. Vol 41, No 3: p 253-259, 1971.

Identifiers: *Irrigation efficiency, *Sprinkler irrigation, Uniformity, Crop production, Wheat

LRS IV GAILLE

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The pattern and application efficiency of water at wind velocities less than 3 km/hr were high with a revolving sprinkler. The loss of water by evapora-tion and wind drift was within 10-15%. The application rate was satisfactory. The water distribu-tion pattern as evident from the uniformity coefficient was uniform. Wind velocities higher than 6

km/hr resulted in considerable loss and non-uniform application of water. The data on water caught in cans approximately reflected the pattern of internal distribution of soil moisture. The ob-served non-uniform application of water signifi-cantly affected the yield of wheat.--Copyright 1972, Biological Abstracts, Inc. W72-12905

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WATER IN AGRICULTURE - ITS USE AND REUSE, For primary bibliographic entry see Field 05D. W72-12964

LOW COST METHODS OF WASTEWATER

TREATMENT,
Water Science Labs., Melbourne (Australia).
For primary bibliographic entry see Field 05D.
W72-12971

OUTLINE OF A TOPOLOGICAL MODEL FOR THE INTERACTIONS BETWEEN AGRICULTURAL MEASURES AND THE ENERGY BALANCE OF THE SOIL, DEMONSTRATED IN CASE OF A STRAW COVER, Agrameteorologische fuer Forschungsanstalt, Brunswick (West Germany).
H. Schrodter, and J. Von Hoyningen-Huene. Arch Meteorol Geophys Bioklimatol Ser B Klimatol Bioklimatol Strahlungsforsch Climatol Bioklimatol Radiat Res. Vol 19, No 2, p 183-198. 1971. Illus. English summary.

1971. Illus. English summary.
Identifiers: *Model studies, *Farm management, *Land treatment, Agriculture, Heat balance, Energy, Interactions, Moisture, Soils, Straw

For the complex relations between cultural treatments (straw cover) and the components of heat balance and moisture balance of a soil without vegetation a relational model is developed. The vegetation a retainman model is developed. Inte structure of the model is analyzed by methods of the theory of graphs. It is shown that there are some basic cycles in the relations between the components of the heat balance or moisture balance, respectively, which are the control mechanisms in the system. The concatenation of the basic cycles gives new subsystems with a feed-back effect which is responsible for the stabilization of the system. By means of a special evalua-tion of the graph a qualitative assertion is given about the interactions of the components and about the influence of the agricultural measure on these interactions with regard to the totality of the system and in consideration of the results ofils; the system and in consacration of the results offis; the mutritional regime of soils according to composition of hydrolyzable N, available P and K forms. The upper horizons of soils of the Oxalis acetosel-la-Vaccinium myrtillus and V. myrtillus aspen forest types were more acidic than those of the forb type of birch and Alnus incana forests. The amount of available nutrients/tree of the first story in thinned-out stands was 2-4 times higher than in the control. Dominance of spruce results in a delayed biological cycle of nutrients, a low content of bases and an oxidizing effect of the precipitation penetrating through the crowns.--Copyright 1972, Biological Abstracts, Inc. W72.13017. amount of available nutrients/tree of the first story

LYSIMETRIC INVESTIGATION ON THE RELATIONSHIP BETWEEN THE DEPTH OF SOIL AND CROP YIELD, Institut National de la Recherche Agronomique,

Versailles (France).

G. Monnier.
Ann Agron (Paris). Vol 22, No 2, p 183-195. 1971.

Illus. English summary.
Identifiers: *Crop production, Deficiencies,
*Depth, Lysimeters, Relationships, Soils.

The relationship between the depth of soil and crop yield was investigated in lysimeter plots over

14 yr. The classification of crops according to the 14 yr. The classification of crops according to the reaction to the depth of soil approximates a classification that would be derived from the period and duration of vegetation. A better forecast is achievable by considering year times crop interaction, as shown in the form of the climatic water deficiency evaluated yearly during the growth of the crop involved. Comparing such deficiency with the growth-water available at the various depths permits improving the classification and identification of the conditions in which the plants are supplied with water; the relationship of the are supplied with water; the relationship of the depth of soil with the crop yield. Study of the yield components of maize corrobrates this conclusion and shows the importance of the time at which water deficiencies occur, duly allowing for the moisture available in the soil.—Copyright 1972, Biological Abstracts, Inc. W72-13025

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

WESTCHESTER-HILLSIDE FLOOD CONTROL STUDIES.
Harza Engineering Co., Chicago, Ill.

Metropolitan Sanitary District of Greater Chicago,

Illinois, May 1971. 80 p, 19 fig, 6 tab. Descriptors: *Urban drainage, *Flood control,

Pescriptors: "Orban dranage, "Priood control, "Storm drains, "Drainage engineering, "Storm ru-noff, Illinois, Retention, Streams, Rivers, Floods, Flooding, Combined sewers, Flood protection, Storage, Detention reservoirs, Storm water, Sur-face runoff, Urbanization, Runoff, Planning, Sewers, Water pollution control. Identifiers: "Westchester (III), "Hillside (III).

A plan is presented for eliminating widespread flooding problems in the Westchester-Hillside area. Some areas within the two-villages presently experience damaging flooding almost annually. Surface flooding, caused by waters in excess of storm sewers and drainage way capacity, come mainly from neighboring unincorporated areas. Improper sewer connections and storm water infiltration were found to be of minor importance. Most sanitary sewer back-ups were found to occur because of flat sewer gradients in these particular areas. Because of channel improvements to Salt Creek, flood water elevations will increase and it is recommended that the flood control plan of the U. S. Soil Conservation Service be implemented. Flood control improvements are recommended for Lower Salt Creek in Cook County. An alternative would be to make provision for detention storage of flood waters in DuPage County. High flows from Addison Creek obstruct outflow from storm sewers and cause flooding. The recommended flood control plan is based on the principle of retention of storm flows near the point of origin both to eliminate overloads on the local sewer systems and to moderate flood flows in the creeks. The recommended plan consists of three new retention basins, expansion of two existing retention basins, and facilities to convey flood water into the basins. Total construction costs for the recommended plan, exclusive of Salt Creek flood control plans, is \$5,432,000. It is recommended that design criteria be changed from providing protection against the 'storm of record' to designing for handling the 100-year recurrance interval storm. This would reduce construction costs to \$3,007,000. W72-12395

WEST BRANCH DUPAGE RIVER FLOOD CONTROL PLAN.
Harza Engineering Co., Chicago, Ill.

Village of Hanover Park and the Metropolitan Sanitary District of Greater Chicago, Illinois, Oc-tober 1971. 35 p, 9 fig, 3 tab.

Descriptors: *Drainage systems, *Detention reservoirs, *Planning, *Flood control, *Storm runoff, Illinois, Retention, Floods, Flooding, Flood recurrence interval, Storm water, Basins, Sewerage, Sewers, Urbanization, Drainage engineering, Urban runoff.
Identifiers: *Hanover Park (III), Metropolitan Sanitary District of Greater Chicago, DuPage River.

Overbank flooding results from increased runoff from urbanized areas and inadequate channel capacity. River channel capacity has been reduced by construction in the channel and flood plain by lack of maintenance so that the channel capacity is lack of maintenance so that the channel capacity is now exceeded for all storms with a recurrence in-terval greater than one year. Sanitary sewer surcharge problems are caused by low and leaky manholes and by the practice of removing sanitary sewer manhole covers in flooded areas in order to drain ponded storm water. In order to alleviate the damages caused by overbank flooding and related damages caused by overbank flooding and related storm sewer back-ups, a plan incorporating the principle of retaining storm flows near their point of origin is recommended. This should prevent overbank flooding caused by runoff from the 100 year storm if the recommended plan is implemented. The total plan for the area is consistent with the policy of the Metropolitan Sanitary District in controlling flows at the Cook County boundary. By use of retention basins the flooding problem will be solved along with some of the anxiety which now prevails among the residents of flood-prone areas. Total construction cost of the project is estimated to be \$3,848,000. The construction program would require about two years. Financing is recommended to be done by various state and local agencies because of the benefits that will acrue to communities other than where the actual construction is done. (Poertner) W72-12396

STREAMFLOW CHARACTERISTICS OF THE POTOMAC RIVER, West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.

M. S. Baloch, E. N. Henry, and W. H. Dickerson. 1972. 276 P, 82 FIG, 39 TAB.

Descriptors: *West Virginia, *Streamflow, *Flow characteristics, *Potomac River, *Gaging, *Streamflow forecasting, Streams, Rivers, Dams, Hydrologic data, River forecasting, Reservoirs, River basins, River flow, Measurement, Flood recurrence interval, Flood forecasting, On-site investigations.

This report is used in conjunction with the publication 'Water Resources Data for West Virginia'
which contains information on surface water
records and water quality. This report enhances
the usefulness of the surface water data by summarizing, for the available period of record, flow
characteristics for the Potomac River Basin including extremes of high and low flows, flow durations, and estimates for the frequency or return
period for given flows. It also gives information on
the season or time of year when the extremes of
flow can be expected. To aid in the interpretation
of these data, the report contains a brief description of the physical features of the basin and some
information on the hydrological characteristics of tion of the physical features of the basin and some information on the hydrological characteristics of surface waters and groundwater. As an aid in the understanding of streamflow characteristics, a more detailed description of climate has been added. The primary data were obtained from 23 againg stations, some small reservoirs, and numerous small flood detention dams. (Poertner) W72-12401.

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

STORM DRAINAGE STUDY, KANSAS CITY METROPOLITAN REGION.
Metropolitan Planning Commission-Kansas City

May 1971. 49 p, 2 fig, 41 ref.

Region, Mo.

Descriptors: *Drainage programs, *Urban drainage, *Flood plain zoning, *Ordinances, *Flood control, Drainage practices, Planning, Flood plains, Storms, Stormwater, Census, Financing, Zoning, Drainage engineering, Missouri, Kansas, Drainage systems, Regional analysis, Urban runoff, Storm runoff, Regional develop-ment, Urbanization, Retention, Storage, Detention reservoirs.

Identifiers: *Kansas City (Missouri).

To provide some preliminary guidelines for the growth of the region until more specific plans can be developed, the Metropolitan Planning Commission has prepared a weries of interim studies of which this is one. This study is a comprehensive review of storm drainage problems within the eight-county Kansas City Metropolitan Region. An inventory is included on: (1) areas which are subject to frequent flooding; (2) the major flood control projects and storm drainage improvements including methods for financing; and (3) the location and extent of special drainage improvement districts. The report also includes: a list of priorities for all projects that are proposed; a discussion of methods which are used to assure flood protection in new urban developments; a statement of policies relating to flooding and storm drainage requirements in the planning area; an appraisal of the relative levels of flood problems found in the planning area; and model storm drainage and flood plain zoning ordinances that may be used by governmental units in the Planning Area to assess storm drainage needs. Maps are included with the study to show existing and proposed reservoirs, flood plains, and levee and channel improvements in the eight-county area. (Poertner) W72-12402

NATURAL RESOURCE PLAN-WATER RESOURCES.

McLean County Regional Planning Commission, Bloomington, Ill. For primary bibliographic entry see Field 06D. W72-12405

PUMPED-STORAGE POTENTIAL OF THE PACIFIC NORTHWEST, PARTS I, II, AND SUMMARY REPORT.

Corps of Engineers, Portland, Oreg. North Pacific Div For primary bibliographic entry see Field 03E.

W72-12411

ENVIRONMENTAL STUDY OF THE UNZ-MARKT AREA, STYRIA (INNER ALPINE BEECH TREE ISLAND),

Forstliche Bundesversuchsanstalt, Vienna (Austria).

Forstl Bundesversuchsanst Inst Standort, 23, p 1-

Identifiers: Austria, Beech D, Elevation, *Environment, Fir G, Larch G, Precipitation, Spruce G, *Styria (Austria), Temperature, Trees.

The geographic location, climate, geology, and topography, the soil (methods, description of profiles, analytical data), the vegetation (floristic character, specific groups, forest associations, tree species) and the environmental structure (verhorizontal, growth areas) are described. The area is located on the slopes of the Rosskegel area is located on the slopes of the Rossacge range and includes an elevation span of from 1000 to 1479 m. The area forms part of the northern alient intermediary zone where beech and fir stands border on spruce and larch stands. Temperature increases while precipitation decreases with increasing altitude and the area is divided into a moderately warm level and a cool level of decidu-ous stands and a cold level of conifers. The geolo-gy of the area is polymorphic which divides it into numerous segmental units.--Copyright 1972, Biological Abstracts, Inc. W72-12413

WATER IMPORT STUDIES, District No. 1, Lubbock, Tex. F. A. Ravner.

e Cross Section, Vol 17, No 8, p 1-2, August

Descriptors: *Water transfer, *Water conveyance, *Mississippi River Basin, *Texas, *New Mexico, History, Water demands, Groundwater development, Groundwater mining, Irrigation practices, Economics, Water levels, Monitoring, Surveys, Aquifers, Appropriation, Water sources, Water costs, Benefits, Water supply, Water users. Identifiers: *Texas High Plains.

The history, value, proposal and findings of water import studies are discussed. The studies are supported by the U.S. House of Representatives, and concern importation of water to West Texas-E ern New Mexico. Early water demands in the Texas High Plains were limited and groundwater easily met these needs. Groundwater resources were mined and diminished as irrigation agriculture became the basic economy. Studies by the Federal Public Works Administration and Works Progress Administration led to continual waterlevel monitoring. This work showed the depletion of the aquifer. About \$4,652,000 have been appropriated for the import studies. The U.S. Army Corps of Engineers have been studying the lower Mississippi River Basin area as a water source for importation. An interim report concluded that it is physically feasible to transport about 16.5 million acre feet of Mississippi water annually, costs of imported water exceed irrigator's ability to pay regardless of route, economic benefits to non-farmers are large, and delivery costs can be reduced by incorporating benefits other than water supply. (Popkin-Arizona) W72-12511

SLICING UP THE OPEN SPACE: SUBDIVISIONS WITHOUT HOMES IN NORTHERN CALIFORNIA, J. J. Parsons

Erdkunde, Vol 26, No 1, p 1-8, 1972. 1 fig, 1 tab, 16

Descriptors: *Social aspects, *Land development, *Land use, *Rural areas, *Water pollution, Sewage, Septic tanks, Recreation development, Lakes, Economic feasibility, Urban sociology, Economic impact, California.

Identifiers: *Recreational subdivisions, *Corpora-

Land speculation is an American tradition and has been mainly centered in urban fringe areas or just beyond suburbia. A new form of land speculation involves recreational subdivisions in regions remote from cities. It is mainly practiced in California, where urban population increases have led to physical congestion and emotional anxiety. Possession of a parcel of land, however small, in a remote, clean section of the state has therefore become a middle class ambition. The methods used by the promoters to attract and sell to buyers are described. Many large corporations have joined local developers in slicing up large tracts of remote and inexpensive property and packaging it for subdivisions. In California, the largest is Boise-Cascade Corporation, with 12% of its 1969 net sales accounted for by such developments. This company considers water access a sine qua non of its developments and builds many lakes. The high pressure advertising and sales probably create artificial demands, because few people actually build in such subdivisions and there is little or no lot resale market. Other unfavorable economic aspects for the buyer are discussed and it appears in general that such lots are very poor investments. The subdivisions pose threats to domestic water unacceptable while sewage lines are too impracti-cal and costly. The root of the problem lies in the basic values of American society concerning land ownership. (Casey-Arizona) W72-12520 supplies. In some areas septic tanks have become

EFFECTS OF NITROGEN SOURCE AND PHOSPHORUS ON CRESTED WHEATGRASS GROWTH AND WATER USE,

Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center. For primary bibliographic entry see Field 03F. W72-12525

RADIOISOTOPE UPTAKE BY SELECTED RANGE FORAGE AND WEED SPECIES, Agricultural Research Service, Reno, Nev. Crops Research Div.

R. E. Eckert, Jr., and C. R. Blincoe. Journal of Range Management, Vol 23, No 5, p 367-369, September 1970. 1 tab, 11 ref.

Descriptors: *Isotope studies, *Plant growth regu-lators, *Radioactivity effects, *Forages, *Weeds, Range grasses, Ranges, Depth, Volume, Gamma rays, Soil horizons, Root systems, Wheatgrasses, Annual, Copper, Molybdenum, Iodine, Chromium, Energy, Solubility, Acidity, Soil chemical properties, Moisture availability, Leaching, Tracers.

Growth and survival of perennial grass seedlings on rangelands are closely related to depth, spread and volume of root systems of competing species. This study evaluates the uptake of a group of gamma-emitting isotopes from an important range soil by range plants, and estimates their value for root-tracing studies. Two wheatgrasses, one annual grass and one annual forb were used with 14 isotopes. Uptake of copper, molybdenum and selenium ranged from moderate to very good in all soil horizons. Iodine and chromium uptake was poor on the surface and lower soil horizons, but moderate to very good in other horizons. Half-lives of from 12.8 hours to 128 days, and energy differences which permit detection of each isotope in the presence of others are desirable characteristics for root tracing. Tracer solubility, soil pH, moisture level and leaching are factors present in isotope mobility. (Popkin-Arizona) W72-12532

TEMPERATURE AND MOISTURE STRESS AF-FECT GERMINATION OF GUTIERREZIA SAROTHRAE, Forest Service (USDA), Flagstaff, Ariz. Rocky

Mountain Forest and Range Experiment Station. W H Kruse

Journal of Range Management, Vol 23, No 2, p 143-144, March 1970. 2 fig, 3 ref.

Descriptors: *Weed control, *Germination, *Temperature, *Moisture stress, *Soil-water plant relationships, Effects, Limiting factors, Control, Weeds, Forages, Crop production, Consumptive use, Pinyon Pine trees, Juniper trees. Identifiers: *Gutierrezia sarothrae.

Reduction of the noxious broom snakeweed in the southwestern pinyon-juniper regions increases production of usable forages. This laboratory study measures effects of temperature and moisture stress on snakeweed germination. Moisture stresses of 0.2, 1.2, 2.4, 6.0 and 12.0 atm, and temperatures of 40, 50, 60, 70, 80 and 90 degrees F were tested on snakeweed seeds. Germination was best at 60 and 70 degrees F. Seeds P c n v fe si c ra la P fl in que fa

WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Control of Water on the Surface—Group 4A

did not germinate at 40 and 90 degrees F. Germination was inversely related to moisture stress. (Pop-kin-Arizona) W72-12533

SOIL MOISTURE, FORAGE, AND BEEF PRODUCTION BENEFITS FROM GAMBEL OAK CONTROL IN SOUTHWESTERN OAK CON'

Colorado State Univ., Hesperus. San Juan Basin Branch Station.

Journal of Range Management, Vol 25, No 2, p 146-150, March 1972. 4 fig, 4 tab, 9 ref.

Descriptors: *Oak trees, *Range management, *Soil moisture, *Productivity, Grazing, Livestock, Land use, Herbicides, Forages, Grasses, Forests,

*Colorado. Identifiers: *Foothill rangelands.

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Gambel oak is widespread in the foothill range-lands of the southwestern U.S., growing with pinyon r.ce and juniper at 7,000 ft and with spruce and aspen at its upper elevation limits of 10,000 ft. Its value on rangelands is unknown, but livestock its value on rangelands is unknown, but livestock grazing oak rangelands tend to overgraze open areas and graze only lightly under the oak. Soil moisture determinations were made over 4 summer seasons in a Gambel oak-grass type range. The study sites included open areas between oak clumps, undisturbed oak clumps and 100% controlled oak. Significantly greater soil moisture was found on totally controlled plots compared to nonfound on totally controlled plots compared to non-treated oak sites. The greatest soil moisture dif-ferences occurred from the 2- to 5-ft depths. Two 25-acre pastures were used in a paired plot grazing study. On the treated pasture all brush was killed by herbicides. Both pastures were grazed moderately. Forage production determinations showed a substantial increase in forage as a result of brush control, narticularly in the oak thickets. showed a substantial increase in forage as a result of brush control, particularly in the oak thickets. This was reflected in livestock gains of 18 lb/acre over a 5-year period on the brush-controlled pasture. Controlling Gambel oak obviously provides more soil moisture for grass use when good control is achieved of both stems and sprouts. (Casey-Arizona)
W72-12534

BIOTIC AND HYDROLOGIC VARIABLES IN PRAIRIE POTHOLES IN NORTH DAKOTA. Geological Survey, Denver, Colo.

C. E. Sloan.

Journal of Range Management, Vol 23, No 4, p 260-263, July 1970. 3 fig, 2 tab, 4 ref.

Descriptors: *Hydrologic aspects, *Biota, *Potholes, *Grasslands, *Depressions, Vegetation, *North Dakota, Glaciers, Geomorphology, Missouri River, United States, Wildlife habitats, Missouri River, United States, Wildlife habitats, Waterfowl, Stock water, Water supply, Hydrology, Climate, Geology, Topography, Groundwater, Land management, Wetlands, Plants, Precipitation, Surface runoff, Seepage, Dissolved solids, Water quality, Dynamics, Environment, Spatial distribution, Temporal distribution, Variability, Chemical analysis, Plant groupings, Soil-water-plant relationship plant relationship.

Prairie potholes (sloughs) are depressions of gla-cial origin north of the Missouri River in the prairie region of the United States and Canada which pro-vide valuable wetland habitat for migratory waterfowl. Potholes are widely used for stock-water supplies. Wide variations in pothole hydrology are caused by differences in climate, geology, topography, ground-water hydrology and land use. Wetraphy, ground-water hydrology and land use. Wet-land plants are adjusted to hydrologic regimen. Potholes water results from precipitation, surface flow and seepage inflow of groundwater. Seepage inflow prevents slough drying and affects water quality. Dissolved solids from precipitation, sur-face flow and seepage inflow are about 5, less than 50, and greater than 500 mg/l. Prairie potholes occupy a dynamic hydrologic environment c. wide spatial and temporal variations, where wetland plants smooth out short-term hydrologic variations. Tables give chemical analysis of pothole water and relate water quality to 5 types of plant associations. (Popkin-Arizona) W72-12535

LEHMANN LOVEGRASS ON THE SANTA RITA EXPERIMENTAL RANGE, 1937-1968, Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station. D. R. Cable.

Journal of Range Management, Vol 24, No 1, p 17-21, January 1971. 5 fig, 1 tab, 6 ref.

Descriptors: *Vegetation establishment, *Revegetation, *Range grasses, *Range management, *Soil-water-plant relationships, *Plant *Vegetation growth regulators, Plant growth, Experimental farms, Ranges, Forest fires, Southwest U.S., Soil, Rainfall, Seeds, Summer, Dominant organisms, Mesquite, Crop production, Winter, Spring, Grazing, Arid lands, Forage palatability, Arizona. Identifiers: Santa Rita Experimental Range.

Lehmann lovegrass has been widely used to revegetate drier portions of southwestern ranges and burned areas since the 1930's. Thirty years ex-perience with the grass under varying soil, rainfall and seeding conditions are reported. Objections to Lehmann are lower palatability than native perennial grasses during the summer growing season, and eventual domination over native grasses. Assets include (1) rapid establishment from seed under adverse conditions, (2) automatic reseeding after fire or other disturbance, (3) invasion of mesquite areas to produce high herbage yields, (4) excellent yearly carryover of herbage, (5) production of green herbage during winter and early spring, and (6) ability to withstand repeated close grazing. Results of studies between 1937 and 1968 on the Santa Rita Experimental Range are presented in text and figures. (Popkin-Arizona) W72-12539

SOME WATER MOVEMENT PATTERNS OVER AND THROUGH PINYON-JUNIPER LITTER, Utah State Univ., Logan. Dept. of Range Science.

G. F. Gifford.

Journal of Range Management, Vol 23, No 5, September 1970, p 365-366. 2 fig, 4 ref.

Descriptors: *Soil-water movement, *Litter, *Pinyon pine trees, *Juniper pine trees, *Penetration, *Water distribution (Applied), Water loss, Spatial distribution, Temporal distribution, Rainfall disposition, Interception, Transpiration, Soil properties, Fluorescent dye, Canopy, Density, Vegetation, Biological properties.

Water movement patterns may exist due to unique spatial and temporal characteristics of rainfall, or because of floral characteristics which influence interception, transpiration, etc. and/or because of soil characteristics. This paper investigates water movement pattens over and through pinyon-ju-niper leaf litter. Fluorescent dye patters depicting water movement over and through litter accumulations varied according to canopy density of trees. Where canopy was closed, dye was confined to the surface 1-inch of litter with no lateral movement; where canopy was open, dye was found to a maximum of 6 inches beneath litter and lateral downhill movement of at least 25 inches; where dye penetrated litter, both a streaked and a uniform pattern of water movement occurred.
Water movement patterns are variable and related to tree canopy density. (Popkin-Arizona) W72-12540

EFFECTS OF CLIPPING AND SUPPLEMENTAL NITROGEN AND WATER ON LOAMY UPLAND BLUESTEM RANGE, Kansas State Univ., Manhattan. Dept. of Agrono-

my. C. E. Owensby, R. M. Hyde, and K. L. Anderson. Journal of Range Management, Vol 23, No 5, Sep-tember 1970, p 341-346. 6 tab, 3 fig, 22 ref.

Descriptors: *Bluegrasses, *Environmental effects, *Plant growth regulators, *Nitrogen, *Moisture availability, Effects, Loam, Ranges, Fertility, Crop production, Farm management, Water conservation, Seasonal, Water utilization, Consumptive use, Grasslands. Identifiers: *Clipping.

Moisture availability and nitrogen fertility are implicated as principal environmental factors limiting herbage production in grasslands. The relative importance of supplemental moisture and nitrogen (N) for bluestem range, with attention to haying management, is investigated. N and water separately and combined, were added to loamy upland bluestem range for 4 years, where plots were clipped at different dates. Moisture addition mental N substantially increased yields, but supplemental N substantially increased yields particularly on coal-season species. Clipping reduced moisture uptake and nitrogen addition increased it. (Popkin-Arizona) W72-12541 failed to increase total herbage yields, but supple-

GULF INTRACOASTAL WATERWAY, TEXAS SECTION, (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, Galveston, Tex.

Available from the National Technical Informa-tion Service as PB-198 927-F, \$3.00 in paper copy, \$0.95 in microfiche. March 15, 1972. 59 p, 1 map.

Descriptors: *Texas, *Environmental effects, *Project planning, *Channel improvement, Dredging, Disposal, Alternate planning, Administrative agencies, Adoption of practices, Coordination, Water resources development, Turbidity, Benthic fauna, Comprehensive planning, Federal government.

government.
Identifiers: *Environmental Impact Statements,
*Gulf Intracoastal Waterway (Tex), *Matagorda
Bay, *Corpus Christi Bay.

The project involves relocation of two portions of the authorized shallow-draft navigation project in Matagorda and Corpus Christi Bays in Texas. The relocation of the main channel at present dimensions of 12 feet deep and 125 feet wide will be between mile 454.3 and mile 471.3 in Matagorda Bay and between mile 539.4 and mile 550.0 in Corpus Christi Bay. The action will result in reduced pus christi bay. The action will result in reducer maintenance dredging requirements for the realigned channels, thus reducing periodic disturbance of the bay environment by dredging and disposal operations. The action will remove or disturb some motile and benthic organisms, cover some vegetation, and result in a temporary increase in turbidity from dredging and disposal operations. The alternatives include no action and alternate methods of spoil disposal. Destruction of the small amount of benthic organisms and marine the small amount of benthic organisms and marine habitat involved in channel deepening would be irretrievable. Additionally, any losses incurred through destruction of historical or archeological resources would be irreversible. Included are comments from various interested state and federal agencies. (Widman-Florida)
W72-12604

TORTIOUS WATER AND LAND USE IN THE BIG CYPRESS SWAMP, S. D. Robinson.

Miami Law Review, Vol 25, No 4, p 690-712, 1971.

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

Descriptors: *Surface drainage, *Drainage patterns (Geologic), *Riparian rights, *Watercourses (Legal aspects), Drainage, Ecosystems, Hydrology, Water law, Drainage systems, Drainage effects, Drainage area, Drainage water, Surface waters, Hydrologic cycle, Hydrologic systems, Water conservation, Legal aspects, Judicial decisions, Regulation, Water rights, Natural flow, Public rights, Water resources development, Water pollution, Diversion, Flow augmentation, Reasonable use, Florida

Identifiers: *Everglades National Park, Common enemy doctrine.

Scientists predict a damaging ecological change if the Big Cypress Swamp in the Everglades National Park is drained for development. To prevent this development a number of courses are open, including government condemnation and zoning ordinance. A third possible remedy is injunctive relief. The Florida rule as to interference with natural drainage flow is that the upper landowner may not unreasonably appropriate or divert the flow without incurring liability even if it damages the lower landowner. Such a rule is not justified in logic or public policy. A better disposition would be to use a test of reasonableness of increased flow and to compare the parties' equities. The uniqueness of the Everglades renders a complainant's damages at law a nullity. Damages would be of no use to a public which stands to lose its irreplaceable wildlife. Thus an injunction should lie to protect this ecosystem. A concise description of the hydrology, the geological characteristics, and the ecosystem of the area is included. (Brackins-Florida)

ATLANTIC CITY ELECTRIC COMPANY, B. L. ENGLAND STATION--UNIT NO. 3, BEESLEY, FOINT, CAPE MAY COUNTY, NEW JERSEY, GREAT EGG HARBOR BAY (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 08C. W72-12628

FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA—A COMPILATION OF PEAK DATA, OCTOBER 1958 TO SEPTEMBER 1971, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02E. W72-12708

MANAGING A PONDEROSA PINE FOREST TO INCREASE WATER YIELDS, Forest Service (USDA), Fort Collins, Colo. Rocky

Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 03B. W72-12811

LITTER PRODUCTION BY OAK-MOUNTAI-NMAHOGANY CHAPARRAL IN CENTRAL ARIZONA.

ARIZONA, Forest Service, (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station. For primary bibliographic entry see Field 02A. W72-12812.

HYDROLOGIC PERFORMANCE OF ERODED LANDS STABILIZED WITH PINE, Forest Service (USDA), Oxford, Miss. Southern

Forest Experiment Station.

S. J. Ursic, and P. D. Duffy. In: Proceedings Mississippi Water Resources Conference, April 11, 12, 1972, Jackson, Mississippi, p. 203-216. Water Resources Research Institute, Miss. State University.

Descriptors: *Storm runoff, *Sediment yield, *Soil surveys, *Forecasting, *Water yield,

*Demonstration watersheds, *Watershed management, Hydrologic aspects, Loblolly pine trees, Groundwater recharge, Erosion control, *Mississippi.

sippi. Identifiers: Runoff-sediment prediction.

Analyses of annual surface runoff and sediment yield data from eight small (2.6- to 7-acre), severely eroded, north Mississippi catchments stabilized with southern pine have emphasized the im-portance of soil surveys for predicting hydrologic behavior. Average annual and probable maximum runoff/precipitation (RO/P) ratios can be predicted satisfactorily from annual precipitation data and the proportion of catchment area in soils with in-ternal drainage restrictions. For years of average rainfall, differences in annual surface water yield due to soils alone may exceed 8 inches. ferences in probable maximum annual RO/P ratios may approach 0.25. Stormflows from eroded catchments of well-drained soils can largely be eliminated. Results have confirmed the efficinecy of pine plantings in controlling sediment production from deeply eroded and gullied headwaters. The 25-year-old pines have reduced sediment production to an annual average of 0.03 ton per acre. Average annual sediment yields in tons per acre can be predicted by multiplying the average annual runoff in area-inches by 0.0066. Results provide additional insight on how erosion-control tree plantations can be managed to reduce storm runoff and enhance groundwater recharge. (Ursic-Forest Service) W72-12815

PROBLEMS AND TRENDS IN DRAINAGE RESEARCH, MIXED BOUNDARY CONDITIONS.

Iowa State Univ. of Science and Technology, Ames. D. Kirkham

Soil Science, Vol. 113, No. 4, p. 285-293, April 1972. 4 fig, 46 ref.

Descriptors: *Flow nets, *Mathematical analysis, *Drainage, *Seepage, Reviews.
Identifiers: *Boundary values.

Recent trends in drainage research are briefly reviewed. A method of solving seepage problems having mixed-boundary conditions is described. A mixed-boundary value problem is one where the potential is given on part of a boundary and the normal of the potential on the remainder of the boundary. In developing the method, a solution is found for a 2-dimensional dam seepage problem with a known (conformal transformation) solution that can be used as a check. By this method, as opposed to conformal transformations, it is easy to prepare a flow net, and one is presented. The procedure is then generalized in 4 steps. (Casey-Arizona) W72-12823

THE SNOWY MOUNTAINS HYDROELECTRIC AND IRRIGATION SCHEME (AUSTRALIA), W. Hudson.

Proceedings of the Royal Society, London, Series A., Vol 326, No. 1, p. 23-37, 1971. 3 fig, 2 tab, 3 ref.

Descriptors: *River systems, *Diversion structures, *Water resources development, *Social aspects, *Arid lands, Hydroelectric power, Economic feasibility, Irrigation systems, Engineering geology, Environmental effects, Vegetation effects, Political aspects, Personnel management, Topography, Foreign lands, *Australia. Identifiers: *Snowy Mountains Scheme.

Although Australia is richly endowed with mineral resources, nature has been far less generous with water. It is the driest of all continents with an average annual rainfall of less than 18 inches compared with 29 inches for North America and 26 inches for the total land areas of the world.

Evaporation and transpiration consume 90% of the rainfall, compared to 70% for the U.S. There is a paucity of reliable fresh water supplies both because of the low average rainfall and because of the absence of any high mountain ranges. The Snowy Mountains, located in the southeastern part of the country, are the nation's highest land mass. From this region 2 important river systems arise. The Murray and Murrumbidgee Rivers flow westward through thousands of sq km of dry but fertile alluvial plains while the Snowy River flows to waste across the well-watered coastal strip. The Snowy Mountains Scheme is designed to trap the unused waters of the Snowy River and its tributaries and to divert them to the Murray and Murrumbidgee Rivers to augment agricultural and pastoral production. The project should result in bringing over 1000 sq mi of arid lands into agricultural production and producing 3.75 million kw of much-needed peak load power. Power sales sans irrigation water revenues must bear the economic burden of the Scheme. Engineering and ecological problems of the Scheme are treated with some detail as well as the methods devised in handling a large work force including many foreign scientists and technicians. (Casey-Arizona)

TORDON: A NEW BRUSH HERBICIDE,

N. Spray. The Cattleman, Vol 57, No 10, p 42,54, March 1971.1 fig.

Descriptors: *Brush control, *Weed control, *Costs, *Herbicides, *Weeds, Mesquite, 2-4-5-T, Texas, Rates of application. Identifiers: Lotebush, Prickly pear.

Tordon, a new brush herbicide, controls mesquite and other brush. It will kill at least twice as much brush as 2,4,5-T, the most commonly used herbicide in brush control. Several thousand acres of Texas brush have been sprayed by Tordon (sometimes called Picloram) at application rates of one quart (half pound) per acre in West Texas and twice that in South Texas at costs from \$5 to \$10 an acre. In West Texas, Tordon killed 42 percent of mesquite, compared to 22 percent kill using 2,4,5-T. Tordon increased the kill of lotebush, prickly pear and annual broomweed. In South Texas, Tordon killed 24 to 25 percent of the mesquite at half and full concentrations. At other South Texas sites, Tordon at one-pound per acre killed 74, 68, 68, 61, 35, 34 percent of the mesquite, prickly pear, black brush, granjeno, lime prickly ash and white brush respectively. The new herbicide is welcomed to areas in Texas threatened with business failure because of brush. (Popkin-Arizona)

PROBLEMS OF FORESTRY AND IMPROVEMENT OF AGRICULTURE BY FORESTRY MEASURES. THE REPUBLIC 2ND CONFERENCE OF YOUNG SCIENTISTS AND POSTGRADUATES. SYNOPSES OF REPORTS.

Kharkov. 1969. 200 p. Illus. Identifiers: *Forest management, *Forestry, Agriculture, Pest control, Forests, Regeneration, Plant growth, Industries.

The following problems are discussed: forest typology and characteristics of growth of individual stands and their productivity; introduction, selection and grafting of tree species; forest growth conditions of individual regions, their variation in stands of different composition according to management measures; natural and artificial regeneration; forest seed study; effect of the field productive belts on erosion processes including mechanization of forest cultivation. Tree pests and control measures and application of herbicides in coniferous broadleaved young stands are described.—Copyright 1972, Biological Abstracts, Inc.

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BOG FORESTS AND THEIR AMELIORATION. L. P. Smolyak. Nauka i tekhnika: Minsk. 1969. 209p. Illus. Pr. 82

Identifiers: Amelioration, *Bogs, *Forests, Nutri-tion, Soils, USSR.

A general characterization and classification is given of forests growing on bogs and bogged areas of Belorussia, as well as their structure and productivity in relation to the degree of moistening and the fluctuation of the groundwater level. Problems concerning both the soil nutrition and the hydrological regime of forests on bogs are elucidated. The biological basis of amelioration of the groundwater is expounded norms are established. cidated. The biological basis of amelioration of bog forests is expounded; norms are established for draining according to bog type and category, as well as the order of priority and amelioration methods. Recommendations are given for designing amelioration projects.—Copyright 1972, Biological Abstracts, Inc. W72-12918

DRAINING OF YOUNG AND MIDDLE-AGED PINE FORESTS IN MOIST, FAIRLY INFERTILE PINE SITES OF THE POLESIE IN THE UKRAINIAN SSR,
A.I. Mikhovich and A. S. Ryabukha.
Lesovod Agrolesomelior Resp Mezhved Temat Nauchn Sb. 16, p41-54, 1969.
Identifiers: *Drainage effects, *Pine trees, Forests, Plant growth, Ukrainian SSR, Crop response.

The effects of 70-yr draining amelioration on the increase of wood standing volume, increment, and increase of wood standing volume, increment, and rise of site class are presented. The growth period of stands after draining was 43-55 yr; stand siteclass draining rose in strips not over 150 m away from the drainage channels. Pine forests on moist sites should be drained as much as possible.—Copyright 1972, Biological Abstracts, Inc. W72-12920

IMPROVING THE PRODUCTIVITY AND THE RESISTANCE OF FOREST PLANTATIONS OF THE DON AND NORTHERN CAUCASUS STEPPE ZONES, (IN RUSSIAN).

Novocherkassk. Inzh. Melior. Inst. 1969. 291 p. Identifiers: Caucasus, Don, Fertility, *Forests, Plant growth, Plantations, Productivity, Resistance, *Shelterbelts, Soils, Steppes, Trees,

The problems of shelterbelt afforestation in the steppe regions of the northern Caucasus and the Lower Don are examined. The effectiveness of shelterbelts particularly on steep slopes and on sands is shown. Data are given on the formation and growth of stands and on their effect on the fertility of soils. The cultivation of fruit and nut trees and the problems of green plantings are discussed.—Copyright 1972, Biological Abstracts, Inc. Inc. W72-13018

DESICCATION OF ROBINIA PSEUDOACACIA IN RAVINE AND GULLY PLANTATIONS IN THE STEPPE,

N. A. Lokhmatov. N.A. Lokhmatov. Lesovod Agrolesomelior Resp Mezhyed Temat Nauchn Sb. 16, p 120-129, 1969. Identifiers: Cattle, Deficiere, *Desiccation, 'Grazing, Gully, Moisture, Plantations, Ravine, *Robinia-Pseudoacacia-D, Steppe, USSR.

Desiccation was connected with moisture deficiency in the second half of the growth season in dry years, disturbance of the stand due to grazing cattle, and deterioration of the forest environment. Intensification of shoot formation and replacement of the desiccated part of the crown is possible only with sufficient moisture. Selection fellings do not provide for the preservation and sanitation of desiccating plantations. Clearcutting in the fall and cutting the stump low are necessary.—Copyright 1972, Biological Abstracts, Inc.

THE ECONOMIC AND ECOLOGIC ROLE OF GRASSLANDS IN POLAND, Polish Academy of Sciences, Warsaw. Inst. on Agricultural and Forestry Economics. J. Pronczuk.

Postepy Nauk Roln. 2. p 27-38. 1971. Illus. Identifiers: Ecology, Economics, *Grasslands,

Grasslands occupy some 1/7 of the geographical area of Poland. Permanent grasslands influence water retention, regulate flood water, protect slopes and influence development of the flora and fauna settled in a given grassland environment. More than 60% of cattle feed is derived from grasslands which likewise cover some 14% of the feed unit requirements of all domestic animals in the country. Yields of grasslands in Poland are low and consequently they are not fully utilized. It is of urgent importance to pay more attention to the management of permanent grasslands in Poland.— Copyright 1972, Biological Abstracts, Inc. W72-13024

4B. Groundwater Management

A DIMENSIONLESS PARAMETER STUDY OF GROUNDWATER RECHARGE, PHASE II, Oklahoma Univ. Research Inst., Norman. J. F. Harp, and J. G. Laguros. Available from the National Technical Information Service as PB-211 278, \$3.00 in paper copy, \$0.95 in microfiche. June 1972. 33 p, 4 fig, 6 tab. OWRR A-039-OKLA (1).

Descriptors: Aquifers, *Groundwater recharge, *Artificial recharge, *Oklahoma, *Kansas, *Well data, Pumping, *Regression analysis, Permeability, Rainfall, *Observation wells, Water table, Withdrawals.

Identifiers: *Dimensionless parameters, *Aquifer

The method of coefficients has been used to pre-dict groundwater recharge for several years. A new approach was attempted using a 'dimension-less parameter' concept to relate recharge to other known parameters, i.e., pumpage, permeability, rainfall, recharge area, etc. Data from a total of fifteen observation wells from two locations in Oklahoma and two locations in Kansas were used. Oklahoma and two locations in Kansas were used. The high-use municipal wells in southwestern Oklahoma show periodic 'mining' which can be avoided if pumpage rates are modified. The wells in Kansas are located very far from other pumping locations thus rendering the recharge area excessively large. Regression analysis was performed encompassing recharge periods of one month, six months, and twelve months. The resulting linear equations are multiterm, wherein positive coefficients imply no overuse while negative coefficients imply no overuse while negative coeffi-cients substantiate 'water mining,' and these equations predict groundwater recharge rates more ac-curately than heretofore.

GOALS, POLICIES AND MANAGEMENT OF WATER RESOURCES IN THE RIO GRANDE VALLEY, (A.P.J.-1). Herkenhoff (Gordon) and Associates, Al-buquerque, N. Mex.

Middle Rio Grande Council of Governments of New Mexico, Albuquerque, New Mexico, January 1971. 70 p. 11 fig. 12 ref. HUD, New Mexico P-75.

Descriptors: "Water conservation, "Water management (Applied), "Water resources development, "Rio Grande River, "Water policy, "Regional analysis, Water supply, Water distribution (Applied), Planning, Storage, New Mexico, Water utilization, Water treatment, Pumps, Water rights, Water law, Comprehensive planning, Urbanization.

General guidelines are established for the development and management of water resources and the provision of water services within the entire Rio Grande Valley area, known as the APJ-I area. A basis is provided for certification and showing eligibility for federal assistance to local governmental agencies in their development of needed mental agencies in their development of needed water utility systems. Part I presents the adopted goals for water conservation and use within the region, defines the role of local governments in the development and operation of water services, and summarizes the general content of the technical report. Part II, presents and identifies all factors which must be considered in developing water systems or expanding existing systems. The purpose of this area-wide plan is to provide management guidelines to insure compatability concerning local plans and programs related to development of municipal-type water resources. (Poertner) W72-12398

AVAILABILITY OF WATER IN KALAMAZOO COUNTY, SOUTHWESTERN MICHIGAN, Geological Survey, Washington, D.C. W. B. Allen, J. B. Miller, and W. W. Wood. Available from the GPO, Wash. DC, 20402-Price \$6.25. Geological Survey Water-Supply Paper 1973, 1972. 129 p, 36 fig, 9 plate, 16 tab, 34 ref.

Descriptors: *Water resources development, *Surface waters, *Groundwater, *Michigan, Watershed management, Water yield, Water quality, Aquifer characteristics, Hydrologic data, Water utilization, Hydrologic cycle, Precipitation (Atmospheric), Runoff, Streamflow, Flow rates, Water levels, Water storage, Water wells, Water analysis, Pumping, Groundwater recharge, Maps, Hydrographs, Model studies, Forecasting. Identifiers: *Kalamazoo (Mich).

Water facts are appraised that aid in planning the orderly development of the water resources of Kalamazoo County, Michigan, and serve as a guide for management. The report defines the relationship between surface and sub-surface water units and maps variations in water-yielding charac-teristics of principal groundwater units. The availability of water in streams, the location of surface-storage sites, and the use of storage to augment streamflow are described. Average an-nual recharge was determined by means of water nual recharge was determined by means of water budgets utilizing precipitation, temperature, streamflow and water level data. The physical and chemical quality of ground and surface water are related to water use. Present and potential development of the principal subsurface reservoirs and existing pumping centers are described using mathematical models. Areas favorable for development of additional centers of pumping and their tractical limits of development are defined their practical limits of development are defined. Problems may arise with excessive subsurface reservoir development. These problems include changes in streamflow, the need for artificial recharge ponds, and deteriorating water quality. (Woodard-USGS) W72-12408

ABNORMAL PRESSURES AND POTENTIAL GEOTHERMAL RESOURCES IN THE RIO GRANDE EMBAYMENT OF TEXAS, Geological Survey, Bay St. Louis, Miss. Gulf Coast Hydroscience Center. For primary bibliographic entry see Field 02L. W72-12410

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B—Groundwater Management

MAJOR AQUIFERS AND SAND AND GRAVEL RESOURCES IN MARSHALL COUNTY, SOUTH

DAKOTA, Geological Survey, Huron, S. Dak. N. C. Koch.

South Dakota Geological Survey Information Pamphlet No 1, 1972. 9 p, 3 fig, 1 tab.

Descriptors: *Groundwater resources, *Aquifers, *Water wells, *Water yield, *South Dakota, Water quality, Hydrogeology, Aquifer characteristics, Well data, Water properties, Water analysis, Hydrologic data. Identifiers: *Marshall County (S Dak).

Three major glacial aquifers, the Veblen, James, and Coteau-Lakes aquifers, are in Marshall County, South Dakota. The Veblen aquifer underlies an area of about 24 square miles in the northeastern section and yields as much as 500 gpm to wells at depths ranging from 130 to 180 feet. The James aquifer is in the north-central section and yields as much as 500 gpm to properly constructed wells. The Coteau-Lakes aquifer is in the southeastern part of the county. It occurs at or near land surface and is hydraulically connected with the waters in Buffalo, Red Iron and Clear Lakes. Water in the aquifer may be under water-table or artesian con-ditions, and water levels range from that of the lake levels to 40 feet below land surface. The Dakota sandstone aquifer underlies all of Marshall County at depths ranging from 900 feet ot 1,500 Water in the aquifer occurs under artesian conditions. Yields of up to 200 gpm may be obtained from properly constructed wells. (Woodard-USGS) W72-12412

LIQUID-WASTE DISPOSAL AT THE LINFIELD DISPOSAL SITE, DALLAS, TEXAS, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 05B. W72-12414

MISSOURI, LAND OF WATER, For primary bibliographic entry see Field 03E.

HYDRAULIC TESTING OF HOLE UA-1-HTH-1, AMCHITKA ISLAND, ALASKA, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 08B. W72-12421

GROUNDWATER LEVELS IN NEBRASKA-

Geological Survey, Lincoln, Nebr.

C. F. Keech.

Nebraska Water Survey Paper, No 33, May 1972. 90 p, 10 fig, 1 tab, 18 ref.

*Water Descriptors: *Water wells, *Groundwater resources, *Water level fluctuations, *Nebraska, *Groundwater Basic data collections, Hydrographs, Water supply, Irrigation water, Water levels, Water table. Observation wells.

During 1971, installation of irrigation wells in Nebraska increased by 1,952 for a total of 37,244 wells. Holt County, with 82 new wells, led other weils. Holt County, with 82 new weils, led other counties, and Custer and Merrick Counties had 78 well installations each. Adams, Chase, Clay, Hamilton, Hall, Buffalo, Platte, Phelps, Kearney, and Logan Counties increased their number of wells by 50 or more. A little more than four-fifths of the urban water supplies, all the domestic supplies is rural areas, and most livestock supplies are obtained from wells. Also, several public institutions and industrial and commercial firms are selfsupplied with water from wells. Average water levels in the fall of 1971 were lower than those in the fall of 1970 in 64 of the 93 counties in the State. The most significant declines occurred in the Big

Blue River basin where groundwater was heavily pumped for irrigation. Declines averaged 1.41 feet pumped for Irrigation. Declines averaged 1.41 feet in Adams County, 1.61 feet in Clay County, 1.32 feet in Seward County, 1.32 feet in Polk County, 1.39 feet in Seward County, and 1.42 feet in Thayer County. Water-level data from observation wells are presented in tables and hydrographs. (Woodard-USGS) W72-12433

FORMATION AND DISTRIBUTION OF NATURAL FRESH GROUNDWATER RESOURCES ON THE ASIAN MAINLAND (O FORMIROVANII I RASPREDELENII YESTESTVEN-NYKH RESURSOV PRESNYKH PODZEMNYKH VOD AZIATSKOGO MATERIKA), For primary bibliographic entry see Field 02F. W72-12443

UTILIZATION OF HOT GROUNDWATER IN ELMORE AND OWYHEE COUNTIES, IDAHO, Idaho Dept. of Water Administration, Boise. For primary bibliographic entry see Field 05D. W72-12470

RADIOLOGICAL STATUS OF THE GROUND-WATER BENEATH THE HANFORD PROJECT JULY-DECEMBER 1970, Battelle Pacific Northwest Labs., Richland, Wash.

For primary bibliographic entry see Field 05B. W72-12481

THE LOCAL INSTITUTION FOR GROUND-WATER BASIN MANAGEMENT-A REPORT TO THE NATIONAL WATER COMMISSION, High Plains Underground Water Conservation District No. 1, Lubbock, Tex. F. A. Rayner.

The Cross Section, Vol 17, No 10, p 3, October 1971. 1 ref.

Descriptors: *Groundwater basins, *Water management (Applied), *Water resources development, *Groundwater mining, *Water poldevelopment, Groundwater mining, Water pol-lution, Governments, Groundwater movement, Water wells, Regulation, Water control, Benefits, Water costs, Income, Budgeting, Groundwater resources, Human resources, National Water Commission, Texas.

Identifiers: High Plains Underground Water Con-servation District No. 1 (Texas).

The public in recent years has gained a general understanding of the importance of groundwater and its problems of development, depletion and contamination, though appreciation of the mechanics and management of groundwater is generally lacking. Groundwater basin management is the regulation of water wells by owners, and is a people management problem not solved by govern-ment. Management by local government has the following benefits: (1) controlling agency overlies the local regimen, (2) local government is more directly answerable to groundwater users, (3) direct benefactors of management pay the governmental costs, (4) local governmental costs are small, and (5) there are existing governmental frameworks to facilitate local management. Limited income and nearly unlimited responsibili-ties are major problems of local control. Periodic public review of local management funding and policy give the groundwater users ultimate control over the water resource. The High Plains Underground Water Conservation District No. 1, operating in West Texas, is used as a model for local groundwater management. (Popkin-Arizona) W72-12502

THE ANNUAL WATER STATEMENT, 1971-

-1972, High Plains Underground Water Conservation District No. 1, Lubbock, Tex. D. D. Smith.

The Cross Section, Vol 18, No 4, p 1-8, April 1972. 16 tab, 16 fig.

Descriptors: *Water wells, *Water levels, *Water Descriptors: 'water wells, 'water levels, 'water le Id de arth in the railir W

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Presented are tables of water-level measurements made by the Texas Water Development Board in January 1972, in 756 observation wells in the Texas High Plains. Statistical tables and location maps are presented for the wells. Tables include depth to water, water-level fluctuation during the past year, average annual decline during the 1962-72 period, and the standard deviation of all measurements. These data will be used in computing the depletion allowance given by the Internal Revenue Service. Measurement validity is discussed. Only one county of the 15 reported showed a net rise in water table. Heavy rainfall in the late 1971 growing season reduced overall pumpage and allowed for recovery of the cone of depression seasond water the season reduced overall pumpage and allowed for recovery of the cone of depressions around water the season reduced over the season depression around pumped wells. Average depth of water for 1962 and 1972 ranged from 67 to 203 feet and from 86 to 243 feet respectively. (Popkin-Arizona) W72-12503

WATER IMPORT STUDIES, High Plains Underground Water Conservation District No. 1, Lubbock, Tex. For primary bibliographic entry see Field 04A. W72-12511

WATER CONSERVATION SYSTEMS ON IN-CREASE.

High Plains Underground Water Conservation District No 1, Lubbock, Tex. A. W. Sechrist.

The Cross Section, Vol 17, No 8, p 2-3, August 1971. 3 fig.

Descriptors: *Water conservation, *Irrigation practices, *Tailwater, *Playas, Irrigation water, Groundwater mining, Water resources development, Water management (Applied), Surveys, Surface water, Water demand, Groundwater, Economics, Agriculture, Farm practices. Identifiers: *Texas High Plains, Ogallala aquifer.

Irrigators in the Texas High Plains are becoming more aware of the use and depletion of the underground water resources in the Ogallala aquifer according to surveys conducted in 1968 and 1971. Tailwater return pits and playa lake modification installations increased by 105 and 47 respectively between these years within one county alone. Surface water is being conserved to reduce pumping demands on groundwater. As much as one-fifth of irrigation water can be saved by using a tailwater return system. This can extend the life of the aquifer for many years. The economy of the High Plains is based on irrigation agriculture. Water conservation policy in the area makes good farm management. Figures show location of recovery and lake modifications in Parmer County, a constructed tailwater return system and a playa lake modification installation. (Popkin-Arizona) W72-12512

WELL LOCATION MEASUREMENTS, High Plains Underground Water District No. 1, Lubbock, Tex.

A. W. Sechrist. The Cross Section, Vol 18, No 5, p 1 and 3, May 1972, 2 fig.

Descriptors: *Locating, *Well permits, *Irrigation wells, *Well regulations, *Legal aspects, Sites, Well data, Texas, Groundwater, Water management (Applied), Roads.

Identifiers: Texas High Plains, High Plains Underground Water Conservation District No 1 (Tex-

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The correct legal description of property and well location are required for a permit to drill a well in the High Plains Underground Water Conservation the High Plains Underground Water Conservation
District No. 1. Measurement requirements are
defined. Location to existing roads, section lines
and nearby existing wells are discussed in terms of
the proposed well site. Well location is important
in managing the limited groundwater resources of
the Texas High Plains. Two figures show township
range location and location of well from the center
line of a road (Powlin Arisona). line of a road. (Popkin-Arizona) W72-12516

WATER SUPPLY SYSTEM STUDIED,

Texas Tech Univ., Lubbock. Water Resources

T. L. Baker, and S. Rae.

The Cross Section, Vol 18, No 5, p 4, May 1972. 2

Descriptors: *Mills, *Water supply, *Documenta-tion, *History, *Water wells, Engineering struc-tures, Sites, Southwest U.S., Water resources development, Railroads, Boilers, Cattle, Texas, Groundwater.

The Historic American Engineering Record, Department of the Interior, records and documents significant engineering achievements. About 50 sites are being studied in the Southwest. The windmill was one of the most important engineering achievements which influenced the development of West Texas. Windmills, often 50 to 100 feet in diameter, were used in Europe since before the 12th century. The first remarkable American wind-mill was built by Connecticut mechanic Daniel Halladay in 1854. Windmills came to west Texas in 1881 with the railroads to provide a dependable supply of good quality water for steam locomotive boilers. The Dixie Ranch in Lubbock County was the first to use windmills on the Texas High Plains in 1884, where 6 mills were installed for watering cattle. Two photographs show one of the few remaining Eclipse Windmills with a 22 1/2 foot diameter. (Popkin-Arizona) W72-12517

SURVEY OF WESTERN STATES' UN-DERGROUND WATER MANAGEMENT PROVI-

Texas Tech Univ., Lubbock. School of Law For primary bibliographic entry see Field 06E. W72-12529

IRRIGATION AIDS TO STABILIZE ECONOMY, High Plains Underground Water Conservation District No. 1, Lubbock, Tex.

The Cross Section, Vol 17, No 7, p 4, July 1971. 1

Descriptors: Economics, *Irrigation practices, *Crop production, *Feed lots, *Texas, Droughts, Groundwater, Agriculture, Stability, Transporta-

Identifiers: Texas High Plains.

Irrigation agriculture is the basic economy in the Texas High Plains. Drought in the Summer of 1971 caused nearly continuous pumping of the ground water supply. High crop yields are due to irrigation regardless of drought. Irrigation practices stabilize the agricultural economy, without reducing trans-portation and other related needs. This stability is reflected in stabilizing related industries, such as cattle feeding. Feedlots are an industry developing around the stable irrigation economy. (Popkin-Arizona) W72-12530

A DEVICE FOR REMOVING WATER OR MUD FROM SHALLOW WATER WELLS (US-TROYSTVO DLYA UDALENIYA VODY ILI PUL'PY IZ NEGLUBOKIKH GRUNTOVYKH SKVAZHIN), E. Ya. Balsar.

Pochvovedeniye, No 11, p 165, November 1971. 1

Descriptors: *Instrumentation, *Analytical techniques, *Wells, *Water sampling, *Mud, Depth, Investigations.
Identifiers: *USSR, *Latvian SSR.

A device used at the Latvian Scientific Research Institute of Forest Management to remove water, mud, or cuttings from wells is described. The device is a graduated cylinder equipped with an in-verted elastic funnel valve at the bottom. The cylinder is lowered into the well to the desired depth, permitting free entry of water. The funnel valve is pulled up tightly against the bottom, sealing the cylinder, after which the device containing the sample is withdrawn with a minimum of disturbance. The device can be used to obtain water samples at various depths for soil and groundwater investigations. (Josefson-USGS) W72-12689

APPLICATION OF ARTIFICIAL RECHARGE TECHNOLOGY FOR MANAGING THE WATER RESOURCES - ANCHORAGE, ALASKA, Alaska Univ., College. Inst of Water Resources.

G. L. Guymon.

Available from the National Technical Informa-tion Service as PB-211 331, \$3.00 in paper copy, \$0.95 in microfiche. Institute of Water Resources, University of Alaska Report No. IWR-24, June 1972. 40 p, 7 fig, 40 ref. OWRR B-006-ALAS (1).

Descriptors: *Induced infiltration, *Groundwater Descriptors: "Induced intritation, "Croundwater recharge, "Water spreading, "Water management (Applied), Aquifers, Groundwater basins, Heat flow, Temperature control, "Alaska, "Artificial recharge. Identifiers: "Anchorage (Alas).

In spite of an abundant water resource in Alaska,

water supply shortages exist in many communities primarily because of quality consideration. Water temperatures are particularly important because of distribution costs and problems associated with low ambient winter temperatures. As a result there are management needs for water resources in Anchorage, Alaska. Past and current knowledge related to artificial recharge is examined in relation to increasing water table elevation and temperatures of the groundwaters underlying Anchorage, Alaska. Long term infiltration processes are con-sidered from the standpoint of the design and operation of off-stream artificial recharge basins. Significantly the geometry of recharge ponds is re-lated to the temporal infiltration relationship. Because of a noticeable lack of knowledge, it is

difficult to determine aquifer response resulting from artificial recharge. The damped character of groundwater basins seems to preclude warming of groundwaters by selective recharge of warm summer stream flows. W72-12707

GROUND-WATER POLLUTION IN MICHIGAN,

Michigan State Geological Survey, Lansing. Dept. of Conservation.
For primary bibliographic entry see Field 05B.
W72-12797

UNDERGROUND WASTE DISPOSAL, Underground Surveys, Inc., Rockford, Ill. For primary bibliographic entry see Field 05D. W72-12802

UNDERGROUND WASTE DISPOSAL AND CONTROL.

American Water Works Association, New York. Committee on Underground Waste Disposal and For primary bibliographic entry see Field 05B.

ROLE OF GROUND WATER CONTAMINA-TION IN WATER MANAGEMENT, Geological Survey, Raleigh, N.C. For primary bibliographic entry see Field 05B. W72-12807

GROUNDWATER IN THE SANTA CRUZ VAL-

LEY, ARIZONA, Arizona Univ., Tucson. Dept. of Soils, Water and

Regineering.

W. G. Matlock, and P. R. Davis.

Arizona Agricultural Experiment Station, Technical Bulletin 194, April 1972. 37 p. 17 fig. 7 tab. 9 ref.

Descriptors: *Groundwater resources, *Groundwater mining, *Groundwater recharge, *Specific yield, *Arizona, Water sources, Water levels, Withdrawal, Hydrographs.
Identifiers: Santa Cruz Valley (Arizona).

New information is provided for water users and planners of groundwater, the only dependable water source in the Santa Cruz Valley, Arizona. Groundwater levels continued to decline as much Groundwater levels continued to decline as much as 50 feet during the 1965-70 period as a result of water use in excess of natural replenishment. Recharging streamflow along ephemeral channels lessens the decline and in some areas causes a rise in water levels. Declines of more than 125 feet since 1947 have occurred. Depth to water in 1970 ranged from less than 10 feet along some channels to over 600 feet near the mountains. Total 5-year pumpage averaged 187,000 acre-feet per year. A specific yield of 0.12 and an average recharge rate of 55,000 acre-feet are estimated. Location maps, well hydrographs, water level maps, and a graph of specific yield versus recharge are included with water-level tables. (Popkin-Arizona) W72-12850

SUBIRRIGATION-A COMING INNOVATION. For primary bibliographic entry see Field 03F. W72-12859

GROUND-WATER DISCHARGE FROM THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1971. Geological Survey, San Antonio, Tex.

Edwards Underground Water District Bulletin 29, June 1972. 8 p, 1 tab, 11 ref.

Descriptors: *Groundwater resources, *Water wells, *Withdrawal, *Water utilization, *Texas, Groundwater movement, Aquifers, Limestones, Pumping, Discharge (Water), Water yield, Springs, Water supply, Hydrologic data, Data collections, Groundwater recharge, Rainfall. Identifiers: San Antionio Area (Tex).

The estimated total well and spring discharge from the Edwards and associated limestones in the San Antonio, Texas, area during 1971 was 679,500 acre-feet, about 7% less than 1970. The total discharge was 26% greater than the average for 1934-70. About 60% of the total discharge came from wells, and approximately two-thirds of this discharge was from wells in Bexar County. Well discharge in 1971 was 24% greater than in 1970, while springflow decreased by about 30%. Deficient rainfall during the spring and early summer of 1971 was mainly responsible for the increased demand for water from wells and the decrease in the discharge of the springs. (Woodard-USGS) W72-12863

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

SUBSURFACE HYDROLOGY AT WASTE DISPOSAL SITES. IBM Watson Research Center, Yorktown Heights, N.Y.

For primary bibliographic entry see Field 05B. W72-12864

GROUND WATER IN THE TORTUGUERO AREA, PUERTO RICO AS RELATED TO PROPOSED HARBOR CONSTRUCTION, Geological Survey of Puerto Rico, San Juan. G. D. Bennett, and E. V. Giusti. Commonwealth of Puerto Rico Water-Resources

Bulletin 10, 1972. 25 p, 6 fig, 13 ref.

Descriptors: *Groundwater resources, *Water quality, *Construction, *Harbors, *Puerto Rico, Environmental effects, Aquifer characteristics, Forecasting, Saline water intrusion, Model stu-

dies, Planning. Identifiers: *Tortuguero (P.R.), Proposed harbor,

Construction effects.

The Aymamon Limestone of northern Puerto Rico, together with the overlying blanket deposits, forms an important water-table aquifer. At present its use is small, but its potential for development is great. Regional groundwater flow is toward the north, with discharge into coastal swamps and lagoons and also directly into the sea. The discharge occurs both through springs and through areal seepage. The flow is on the order of 7 cubic feet per second per east-west mile of aquifer. Construction of a harbor in a part of Laguna Tortuguero would provide a new avenue of discharge for part of the regional groundwater flow, but would not appreciably alter the amount of flow. Pumpage of groundwater can theoretically be increased to 70% or 80% of the regional flow, provided some control is exercised over the location, depth, and pumping rate of wells. Development of the aquifer to this degree would cause Laguna Tortuguero to become salty even if the harbor were not constructed. If the harbor is constructed, groundwater quality can be protected by diverting fresh water into the parts of the lagoon beyond the harbor levees. If the harbor is not constructed, water quality in the lagoon can possibly be protected against the effects of pumpage by the same method. (Woodard-USGS) W72-12883

GROUND WATER ALONG RIO BUCANO AT PONCE, PUERTO RICO AND THE EFFECTS OF A PROPOSED FLOODWAY ON GROUND-WATER QUALITY.

Geological Survey of Puerto Rico, San Juan. G. D. Bennett.

Commonwealth of Puerto Rico Water-Resources Bulletin 11, 1972. 28 p, 10 fig, 2 tab, 6 ref.

Descriptors: *Groundwater resources, *Construc-*environmental effects, *Water quality, tion. *Puerto Rico, Floodways, Aquifer characteristics, Saline water intrustion, Model studies, Forecast-ing, Planning. Identifiers: *Ponce (P.R.), Proposed floodways,

Construction effects.

The coastal alluvium in the vicinity of the Rio Bucana, on the south coast of Puerto Rico, is an anisotropic water-table aquifer which is heavily utilized for irrigation and other purposes. The rate of both recharge due to irrigation and of withdrawal by pumping are much greater than the rate of lateral groundwater movement through the aquifer. A disruption in the balance between these factors could cause influx of sea water and the gradual development of water-quality problems. A proposed floodway channel on the Rios Bucana Portugues will, in itself, have relatively minor effects on the groundwater system. A general increase in groundwater utilization or a decrease in irrigation recharge would cause seepage of saline water from the proposed channel; but these developments also would induce inflow of salt water from the sea, or from the mangrove swamps, regardless of the construction of the floodway. A proposed fabric dam in the floodway channel would produce a small increase in recharge to the aquifer, sufficient to balance any increase in drainage that might occur due to the lowering of the channel bed near the sea. (Woodard-USGS) W72-12884

CONCENTRATION GRADIENTS AQUIFERS, PHASE II, Tulsa Univ., Okla. For primary bibliographic entry see Field 02F. W72-12952

4C. Effects on Water of Man's Non-Water Activities

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN AREA, 1970,

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 02E. W72-12430

EFFECTS OF FOREST COVER ON WATER REGIME OF SOME MOUNTAIN RIVERS IN THE SOUTH GEORGIAN UPLANDS (O VLIYANII LESA NA REZHIM NEKOTORYKH GORNYKH REK YUZHNO-GRUZINSKOGO NAGOR'YA),

Zakavkazskii Nauchno-Issledovatelskiy. Gidrometeorologicheskiy Institut, Tiflis (USSR). For primary bibliographic entry see Field 02E. W72-12438

THE EFFECT OF FORESTS ON THE WATER BALANCE OF DRAINAGE BASINS,
Ukrainskii Nauchno-Issledovatelskii Gidro-

Meteorologicheskii Institut, Kiev (USSR).

I. S. Shpak. Available from NTIS, Springfield, Va. 22151 as TT70-50172; Price \$3.00 paper copy. Israel Program for Scientific Translations, Jerusalem, 1971. 258 p. (TT 70-50172, Originally published by Naukova Dumka, Kiev, 1968.)

Descriptors: *Forests, *Forest watersheds, *Forest soils, *Vegetation effects, *Water balance, Hydrologic aspects, Hydrologic budget, Precipitation (Atmospheric), Snow cover, Surface runoff, Evaporation, Soil water, Soil moisture, Moisture content, Groundwater, Groundwater recharge, Soil physical properties, Geomorphology, Meteorology, Analytical techniques.

Identifiers: *USSR, *Ukraine, *Forest hydrology, Soil hydrology, Water-balance method, Tretyakov precipitation gages.

Water-balance investigations were carried out in 1958-66 by the Ukrainian Hydrometeorological Scientific Research Institute at the Desna, Velikii-Anadol, and Transcarpathian runoff stations in the Ukraine. Principles of soil hydrology and sources of groundwater recharge are examined in conjunction with the climatic and physiographic characteristics of drainage basins. Special consideration is given to methods for measuring various items in the water balance. The hydrological role of the forest is evaluated in terms of its effect on precipitation, snow cover, surface runoff, soil hydrophysical properties and moisture content, evaporation, and groundwater. A critical examination of the literature on forest influences will provide data for formulating conclusions on the significance of forest vegetation in the regulation of streamflow and in influencing other watershed values. (Josefson-USGS) W72-12442

INFILTRATION AND EROSION STUDIES ON PINYON-JUNIPER CONVERSION SITES IN SOUTHERN UTAH, Utah State Univ., Logan. Dept. of Range Science. For primary bibliographic entry see Field 04D. W72-12531

GRAZING EFFECTS ON RUNOFF AND VEGE FATION ON WESTERN SOUTH DAKOTA

RANGELAND, Agricultural Research Service, Newell, S. Dak. Soil and Water Conservation Research Div. .. Hanson, A. R. Kuhlman, C. J. Erickson, and J. K. Lewis.

Journal of Range Management, Vol 23, No 6, p 418-420, November 1970. 3 tab, 2 fig, 7 ref.

Descriptors: *Grazing, *Storm runoff, *Vegeta-tion effects, *Range management, *Pasture management, Effects, *South Dakota, Crop production, Watershed management, Precipitation, Temperature, Soil-water-plant relationships, Dikes, Cattle, Forage grasses, Range grasses, Dikes, Drainage practices, Flumes, Raingages, Harvest-Statistical methods, Storms, Arid lands.
Identifiers: Turkey's test, Semi-arid lands.

The need for increased rangeland production requires knowledge of how watersheds function under various grazing intensities. This study investigates grazing effects on runoff and vegetation on four 2-acre watersheds on each of three pastures grazed at three intensities from 1942 to 1962. The watersheds are at the Cottonwood Range Field Station, South Dakota, where mean annual precipitation is about 15 inches and average annual temperature is about 47 degrees F. Chestnut soils and short and midgrasses abound. Confining dikes establish drainage areas, and flumes and rain gages measure runoff and precipitation. Vegetation samples were harvested from July transects. Variance was analyzed and means were separated by Turkey's test. Runoff data followed a log-normal distribution. Average seasonal runoff was 0.79, 0.56 and 0.42 inches from heavily, moderately and lightly grazed watersheds. Runoff from long-duration storms might be the same for all the watersheds if storms follow wet periods. Mean weight of live and dead standing vegetation in late July was 1,752, 2,092 and 3,700 pounds per acre for heavily, moderately and lightly grazed watersheds. (Popkin-Arizona)

SUBDIVISION PLANNING THROUGH WATER REGULATION IN NEW MEXICO, New Mexico Univ., Albuquerque. Coll. of Law. C. J. Noya, and T. B. Stribling. Natural Resources Journal, Vol 12, No 2, p 286-297. April 1027 2 5-26.

297, April 1972. 25 ref.

Descriptors: *Domestic water, *New Mexico, *Water law, *Legislation, *Water resource *Water law, *Legislation, *Water resource development, Arid lands, Human populations, Water supply, Recreation demand, Water pollution, Septic tanks, Land use.

The state of New Mexico has carefully managed its water resources but land developers are urging a new population to migrate into the Southwest and, with New Mexico's diminishing water supplies, there will not be enough water to supply fu-ture subdivision needs. New Mexico's water is fully allocated already. However, a review of the state water resources indicated that not all such resources have been developed. Adding to the water shortage problem is greatly increased recreational usage springing from increases in population, urbanization, income, leisure, and improved transportation networks. Competition from this source may greatly decrease supplies of water available for subdivisions. Finally, the septic tanks of the new developments are becoming nore of a danger to domestic water supplies. It is felt that if unregulated growth of subdivisions corresponds to the depletion of New Mexico's water resources, then such growth should be regulated with water resources in mind. Current laws are reviewed, and recommendations for new legislation implementing such regulation are presented. (Casey-Arizona) W72-12831

URBAN WATER PLANNING -- A BIBLIOG-RAPHY.

Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

For primary bibliographic entry see Field 06B. W72-12921

4D. Watershed Protection

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INFILTRATION AND EROSION STUDIES ON PINYON-JUNIPER CONVERSION SITES IN SOUTHERN UTAH,

SOUTHERN UIAH, Utah State Univ., Logan. Dept. of Range Science. G. F. Gifford, G. Williams, and G. B. Coltharp. Journal of Range Management, Vol 23, No 6, p 402-406, November 1970. 2 fig, 4 tab, 5 ref.

Descriptors: *Infiltration, *Erosion, *Pinyon pine trees, *Juniper trees, *Watershed management, Rotations, Range management, Sediment yield, Range grasses, Rainfall simulators, Utah, United States, Ranges, Biota, Climate, Vegetation. Identifiers: *Vegetation conversion programs.

Large-scale pinyon-juniper conversion programs in the western United States require knowledge concerning range and watershed values as in-fluenced by vegetation manipulations. The objective is to investigate infiltration rates and sediment production on converted and nearby untreated pinyon-juniper sites in southern Utah. Infiltration and sediment data from small-plot studies using high intensity simulated rainfall indicate that areas cleared of pinyon-juniper trees and seeded to grass show no consistent change in sediment yields or infiltration rates at given points. Of 14 sites, 4 in-dicated decreased infiltration rates; 2 indicated in-creased infiltration during one or more time intervals at specified points on treated areas; one site had significantly less sediment yield; and 2 sites had significantly higher sediment yields from the treated areas. Results parallel those obtained from similar studies in central Utah. Many biotic, edaphic and climatic variables interact to determine infiltration and erosion rates. (Popkin-Arizona) Arizona) W72-12531

PROPOSAL FOR A DEMONSTRATION WATER QUALITY MANAGEMENT PROGRAM ON THE HOLSTON RIVER IN EASTERN TENNESSEE, Cornell Univ., Ithaca, n.y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05G.

TURBIDITY AND SUSPENDED-SEDIMENT TRANSPORT IN THE RUSSIAN RIVER BASIN, CALIFORNIA, Geological Survey, Menlo Park, Calif.

For primary bibliographic entry see Field 02J. W72-12704

HYDROLOGIC PERFORMANCE OF ERODED LANDS STABILIZED WITH PINE, Forest Service (USDA), Oxford, Miss. Southern

Forest Experiment Station.
For primary bibliographic entry see Field 04A.

GULLY FORMATION IN THE LOESSES OF CENTRAL NEBRASKA, Nebraska Univ., Omaha. Dept. of Geography and

Geology. N. Bariss.

Rocky Mountain Social Science Journal, Vol 8, No 2. p 47-59, October 1971. 11 fig, 1 tab, 17 ref.

Descriptors: *Semiarid climates, *Gully erosion, *Loess, *Geomorphology, *Topography, Gullies, Stabilization, On-site investigations, Land erosion, Channel erosion, *Nebraska.

Although the phenomenon of gullying has received considerable attention in the arid southwest, very little work has been done in the semiarid midwest where gullying is responsible not only for extenwhere guilying is responsible not only for extensive damages in agriculture but also for significant changes in the loess-mantled topography. Using field observations and measurements, topographic maps, comparison of aerial photographs taken in 1936 and 1964, and interviews with various people, gullying was studied in the Broken Bow region of central Nebraska, where loess deposits are up to 80 ft thick. Regions where there was large relative relief between the rim of tablelands and the sur-rounding lowlands seem to offer the highest potential for gullying. Loess has little resistance to vertical erosion, and this results in high speed gullying to considerable depths. The gullying process seems to follow at least a rough program of development, beginning with an initial unstable preparatory phase, followed by stable phases of channel development. If this is so, then prediction about stabilization might be possible. There is much evidence in the region for the furthering of gullying processes by human land mismanagement. (Casey-Arizona) W72-1284

WATER EROSION OF SOILS AND ITS CONTROL AT THE CHUVASH AGRICULTURAL EXPERIMENTAL STATION,
A. V. Osanov.

Tr Chuy S-Kh Opyt Stn. 1, p 66-71. 1969. Identifiers: Agriculture, *Erosion control, Erosion, Hydraulic structures, *Cultivation, Shelterbelts, Soils, USSR, Soil management.

Eroded soils occupy 68.4% of the total arable land Eroded soils occupy 68.4% of the total arable land (5952.5 ha). Erosion control practices include soil management, suitable culture practices (plowing across slopes, boardless plowing on slopes > 6 deg, terracing, harrowing), hydraulic structures (discharge flumes, weirs, wattle-work dams in gullies), and permeable and semipermeable shelter-belts.—Copyright 1972, Biological Abstracts, Inc. W72-12909

NITROGEN NUTRITION OF OAK IN EROSION CONTROL STANDS ON SOILS WITH VARYING DEGREES OF EROSION, V. N. Ugarov.

Lesovod Agrolesomelior Resp Mezhved Temat Nauchn Sb. 18. p. 88-94. 1969. Identifiers: Adsorption, Erosion control, Erosion,

*Nitrogen, *Oak D, Quercus robur D, Soils, Nutritional requirements.

With the increase of soil erosion, the total reserves of N in the soil diminish, and the N requirements of oak (Quercus robur) increase. The biological absorption coefficient and the expenditure of N/unit of biomass of the stand also increase. With the increase of the depth of soil bedding with gravel (to 120 cm), stands can be established for growing timber. Increasing the density of oak stands leads to the increase of nutrient expenditure/unit of biomass and timber.--Copyright 1972, Biological Abstracts, Inc. W72-12919

05. WATER QUALITY MANAGEMENT AND **PROTECTION**

5A. Identification of Pollutants

TENNESSEE WATER QUALITY, SURFACE STREAMS.
Tennessee Water Quality Control Board, Nash-

Tennessee Water Quality Control Board, Nashville, 1972. 102 p, 48 tab.

Descriptors: *Tennessee, *Water quality, *Water sampling, *On-site data collections, *Water analy-sis, Rivers, Coliforms, Temperature, Turbidity, Streams, Irrigation, Recreation facilities, Fish management, Water pollution effects, Monitoring, Pollutant identification, Analytical techniques.

The major part of the water quality data available from January 1, 1968 to December 31, 1971 are brought together. The data are of benefit in the location of public and industrial water supplies, and the development of recreational facilities, fish management and irrigation. Stream monitoring programs, begun in 1967 and continued through 1968, gave additional information on the quality of surface streams and the offerties of sources of polymers. surface streams and the effects of sources of polsurface streams and the effects of sources of pol-lution. These programs were later discontinued due to increased demands for other types of sampling. Water samples were collected in 250 mil-liter glass bottles fitted with glass stoppers. Asep-tic techniques were followed throughout the sam-pling and culturing procedures. Determinations were made for coliform bacteria. The membrane filter techniques used were those outlined in the welfth edition of 'Standard Methods for the Extwelfth edition of 'Standard Methods for the Ex-amination of Water and Wastewater'. Samples from stations too far distant from Nashville to permit their return to the laboratory were analyzed using portable incubators. (Poertner) W72-12400

RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS AND PRECIPITATION COLLECTED IMMEDIATE-LY BEFORE AND AFTER THE SECOND PRODUCTION-TEST FLARING, PROJECT RU-ISON.

LISON, Geological Survey, Denver, Colo

H. C. Claassen.

Available from the National Technical Informa-tion Service, \$3.00 in paper copy, \$0.95 in microfiche. Geological Survey Report USGS-474-122 (Rulison-10, 1971. 10 p, 1 fig, 2 tab, 4 ref. AEC AT (29-2)-474.

Descriptors: *Pollutant identification, *Radiochemical analysis, *Nuclear explosions, *Colorado, Oil industry, Streams, Precipitation (Atmospheric), Natural gas, Rock properties, Tritium, Data collections, Water pollution sources, Water analysis.

The U.S. Geological Survey established a water-sampling network in central and western Colorado to sample the hydrologic environment prior to, during, and following the various phases of Pro-ject Rulison. Project Rulison is an experiment designed to stimulate production of natural gas by explosion of a nuclear device in the gas-reservoir rock. Data obtained by analysis of samples col-lected from the network stations are presented. All of the precipitation samples are routinely analyzed of the precipitation samples are routinely analyzed of the precipitation samples are routinely analyzed for tritium. Stream samples collected at Plateau Creek near Cameo and Colorado River near DeBeque are routinely analyzed for tritium, gross alpha, and gross beta contents. Data are tabulated from samples collected in conjunction with the second production flaring (December 1 to December 20, 1970). The period of observation

Group 5A—Identification of Pollutants

was one of undetectable amounts of tritium in precipitation and lower than the first production flaring values for both tritium and gross radioac-tivity in streams. (Woodard-USGS)

HEAVY METAL CONTENT OF SOME RIVERS AND LAKES IN WALES, Liverpool Univ. (England). Dept. of Oceanog-

raphy.
For primary bibliographic entry see Field 05B.

W72-12425

COMPARISON OF THERMAL DATA FROM AIRBORNE AND VESSEL SURVEYS OF LAKE ERIE.

Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.

A. M. Beeton, J. W. Moffett, and D. C. Parker.

In: Proceedings Twelfth Conference on Great Lakes Research, University of Michigan, Ann Ar-bor, May 5-7, 1969, p 513-528. 11 fig, 1 tab. 10 ref.

Descriptors: *Thermal pollution, *Remote sensing, *Infrared radiation, *Water temperature, *Lake Erie, Chlorides.
Identifiers: *Airborne surveys, Vessel surveys,

*Detroit River, Infrared scanner, Infrared

An airborne radiometer and infrared scanners were evaluated for detecting water masses and currents in fresh water. Infrared scanners used indium antimonide and mercury doped germanium detectors which had recording capabilities in the 1.0 to 5.5 micron and 8.5 to 13.5 micron region, respectively. The radiometer also used a mercury doped germanium detector. The scanners were used to make thermal strip maps and the radiometer was used to obtain surface temperatures of the western end of Lake Erie and the lower Detroit River. Simultaneously, surface water temperatures were taken and water samples were collected for chloride determinations from four vessels making a 4 day synoptic survey of the test area. The remote infrared measurements are compared with shipboard temperature data to evaluate their usefulness in demonstrating thermal structure. water masses, and currents in the test area. The distribution of temperatures in the Lake was not as detailed in the imagery as in the data from synoptic sampling from the vessel. (Upadhyaya-Vanderbilt) W72-12455

A PROGRAM TO ASSESS THE THERMAL DISCHARGE FROM A PLANNED NUCLEAR POWER PLANT ON CAYUGA LAKE, Cornell Aeronautical Lab., Inc., Buffalo, N.Y. For primary bibliographic entry see Field 05B. W72-12456

FRESH WATER AND ESTAURINE SPECIFIC GRAVITY DIAGRAMS,

State Univ. Coll., Fredonia, N.Y.

Lake Erie Environmental Studies, Technical Data Report No. 3, February 1970. 10 p, 5 fig, 6 ref.

Descriptors: *Specific gravity, *Dissolved solids, *Lake Erie, Salinity, Density, Winds, Water temperature, Currents (Water), Hydrometers, Conductivity, Sodium chloride, Calcium carbonate, Profiles, Depth, Estuaries, Lakes, *Pollutant identification. identification Identifiers: *Pycnocline.

If pollutant concentrations cannot be measured by conductivity methods as in the case of organic pollutants, effluent densities may be readily obtained using a hydrometer. The wide-range diagrams promay be used in connection with an inexpensive hydrometer in estuarine studies for a rough approximation of salinity at the sampling location.

Three first approximation diagrams have been constructed within the ranges of total dissolved substances normally found in fresh waters, saline inland waters, and coastal estuaries. The total dissolved substances in solution may be obtained from the specific conductance of the water sample by the method suggested if conductivity determinations are corrected to 25C. To use the specific gravity diagrams provided, the total dissolved sub-stances are plotted against the water sample temperature for each depth sampled. Four examples have been plotted to illustrate the use of the profiles with data from lakes showing strong gradients in temperature and total dissolved substances. However, with these data a minor error in the determination of temperature or total dissolved substances probably exists. (Osborne-Van-W72-12458

FORECASTING OF THE AIR TEMPERATURE AND HUMIDITY OVER THE WATER SURFACE ON THE BASE MEANS METEOROLOGI-CAL ELEMENTS FROM LAND STATIONS (PROGNOZOWANIE TEMPERATURY I WIL-GOTNOSCI POWIETRZA NAD POWIEZCHNIA JEZIORA NA PODS TAWIE WARTOSCI ELEMENTOW METEOROLOG-ICZNYCH NA LADZIE),

State Inst. of Hydrology and Meteorology, Warsaw (Poland).

E. Kasprzycka.

Prace Panstwowego Instytutu Hydrologiczno-Meteorologicznego, No. 100, p 85-90, 1970. 7 fig, 2

Descriptors: *Forecasting, *Temperature, Humidity, Cooling, Powerplants, Vapor pressure, On-site investigations, Theoretical analysis, *Air pollution. Identifiers: *Patnow Lake (Poland), Floating data

Experimental work was started in April 1969 on the transformation of air masses at Patnow Lake which is included in the open cooling cycle of two power stations. Using full meteorological observations made during May 1969, air temperature and water vapor pressure over the Patnow Lake surface were computed theoretically. The values of air temperature and water vapor pressure obtained theoretically were compared to the values obtained experimentally during observations taken on a floating station. (Upadhyaya-Vanderbilt) W72-12462

METEOROLOGICAL EFFECTS OF THE HEAT AND MOISTURE PRODUCED BY MAN. National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab. S. R. Hanna, and S. D. Swisher.

Nuclear Safety, Vol 12, No 2, p 114-122, March-April 1971. 2 tab, 42 ref.

Descriptors: *Weather patterns, *Heat, *Moisture, Cooling towers, Meteorology, Tem-Descriptors: perature, Precipitation, Powerplants, Kinetic energy, Heat budget, Energy dissipation, Cli-mates, *Air pollution. Identifiers: Cooling ponds, Plumes.

Weinberg and Hammond calculated that the energy released artificially by man is now equal to 4.9 x 10 to the 19th power erg per sec and will approach a maximum level of about 4 x 10 to the 21st power erg per sec (for 20 billion people). Energy production per unit area for natural and artificial processes is estimated. The flow of heat and moisture involved in cooling heated water from power plants in lakes, in rivers, in the ocean, and at a city's surface has been studied by several investigators and is discussed. The discussion of small-scale effects of waste heat and moisture is limited mainly to cooling-tower plumes. Ten 1000 Mw power plants produce about 10 percent of the heat and moisture produced in a large lake-effect storm. This artificial-energy production can in-fluence clouds, storms, snowfall, and convective activity. Atmospheric processes are now being significantly influenced on length scales up to about 20 Km. Needs for future research efforts dealing with small, medium, and large scale effects of man's activities are emphasized. (Upadhyaya-W72-12464

THE CONTINUOUS DETERMINATION OF SODIUM IN HIGH PURITY WATER BY USING A SODIUM MONITOR INCORPORATING A SODIUM-RESPONSIVE GLASS ELECTRODE, Electronic Instruments Ltd., Chertsey (England). For primary bibliographic entry see Field 02K.

INTERVAL SCANNING PHOTOMICROGRAPHY OF MICROBIAL CELL POPULA-

Pennsylvania State Univ., University Park, Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W72-12483

INITIAL STUDIES ON THE MICROBIAL BREAKDOWN OF TRIALLATE,
Saskatchewan Univ., S, Regina, Dept. of Biology.
For primary bibliographic entry see Field 05B. W72-12485

COLOR INFRARED (CIR) PHOTOGRAPHY: A TOOL FOR ENVIRONMENTAL ANALYSIS, Dartmouth Coll., Hanover, N.H. Dept. of Geog-

raphy. D. T. Lindgren.

Available from the National Technical Information Service as PB-204 472, \$3.00 in paper copy, \$0.95 in microfiche. Final Report, August 1971. 42 p, 8 ref. Contract No. DI-14-08-0001-12958.

Descriptors: *Remote sensing, *Pollutant identifi-cation, Water pollution, *Monitoring, Aerial photography, *Infrared radiation, Water quality, Algae, Water quality control, Eutrophication, Waste water treatment, Sedimentation rates, Oil spills, Water pollution sources.
Identifiers: *Color infrared photography

The nature of color infrared film (CIR), its capabilities and limitations, are described and its potential as a tool in environmental studies is discussed. Included is a section on the use of CIR in water quality analysis. The growth of algae is easily detected by this technique, which can be used as an indicator of undesirable conditions. In treatment facilities, CIR has been used to identify trickling filters that are overloaded since they reflect greater amounts of infrared than those that are operating efficiently. CIR can also be used to determine the degree of sedimentation of bodies of water. For detection of oil spills, CIR has not proven as reliable as other types of film because of its sensitivity to sun angles. Finally, CIR can be used for dead-fish counts where some toxic substance has been released in the water. (Mortland-Battelle) W72-12487

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NUCLEAR TECHNIQUES FOR TRACE ELE-MENT AND RADIONUCLIDE MEASURE-MENTS IN NATURAL WATERS, Battelle Memorial Inst., Richland, Wash. Pacific

Northwest Labs. R. W. Perkins, and L. A. Rancitelli.

Available from the National Technical Information Service as BNWL-SA-3993, \$3.00 in paper copy, \$0.95 in microfiche. Report No. BNWL-SA-3933; July 1971, 31 p. 10 fig, 5 tab.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants-Group 5A

Descriptors: *Trace elements, *Radioisotopes, *Water analysis, Pollutant identification, Industrial wastes, Radioactive wastes, Nuclear wastes, Radioactivity techniques, Water pollution sources, Neutron activation analysis, Spectromesources, Neutron activation analysis, Spectrometers, Ion exchange, Chlorine, Bromine, Lead, Zinc, Manganese, Cobalt, Chromium, Cesium, Copper, Iron, Mercury, Potassium, Sodium, Radium radioisotopes, Radiochemical analysis, Strontium, Alkaline earth metals, Sodium chloride, Salts, Spectrophotometry.

Identifiers: Ge (L.i) diode, Gamma-ray spectrometry, Selenium, Scandium, Rubidium, Chromium radioisotopes, Sodium radioisotopes, Chlorine radioisotopes, Sample preservation, Aluminum oxide, Antimony, Uranium, Chemical interference, Silver, Arsenic.

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Nuclear techniques are described for the analysis of trace elements and radioisotopes in natural waters. In trace element analysis, sodium chloride masks many of the short-lived radioisotopes that must be identified if certain trace elements are to be measured. Chemical separation of sodium and chlorine must be accomplished; a method to pro-vide this separation involves freezing the sample vide this separation involves freezing the sample followed by irradiation, etching surface contaminants, melting, and filtering. Counting particulate matter on the filter is done by Ge (Li) diode gamma-ray spectrometry. Measurement in sea water is much more difficult due to lower concentrations of the trace elements and greater interference. ference from sodium. For measurement of radioisotopes a large volume water sampler, utilizing aluminum oxide, has been developed to permit the separation of radioisotopes from sample volumes up to tens of thousands of liters. The effivolumes up to tens of thousands of inters. The etri-ciency of aluminum oxide for retention of several radioisotopes of interest has been demonstrated both in the laboratory and in situ in the Pacific Ocean. (Mortland-Battelle) W72-12489

CORRECTED IDENTIFICATION OF A TEST ORGANISM (ATCC 4352) PREVIOUSLY THOUGHT TO BE ESCHERICHIA COLI, Brown (Claude P.) and Associates, Philadelphia,

ra. C. P. Brown, and F. H. Wilson. Applied Microbiology, Vol. 23, No. 3, p 661, March 1972. 1 tab.

Descriptors: *Bioindicators, *Pollutant identifica-tion, *Systematics, E. coli, Analytical techniques, Biochemistry, Disinfection, Testing, Enteric bac-teria, Coliforms, Bactericides, Biological proper-

Identifiers: *Klebsiella pneumoniae, Biochemical tests, Sensitivity, Antiseptics.

During tests to evaluate an antiseptic, a gram-negative test organism, (ATCC 4352), previously identified as E. coli, was found to show con-siderably different susceptibility than another E. Coli strain, ATCC 11229. In subsequent biochemi-cal studies, ATCC 11229 produced the proper reactions for E. coli, but the ATCC 4352 strain produced the reactions of Klebsiella pneumoniae. ATCC 4352 has been used extensively as a test or-ganism so its true identity is considered signifi-cant. (Mortland-Battelle) W72-12492

MICROFLORA OF SOIL AS VIEWED BY TRANSMISSION ELECTRON MICROSCOPY, Pennsylvania State Univ., University Park. Dept. of Microbiology. H. C. Bae, E. H. Cota-Robles, and L. E. Casida,

Applied Microbiology, Vol. 23, No. 3, p 637-648, March 1972. 14 fig, 1 tab, 35 ref.

Descriptors: *Cytological studies, *Soil microorganisms, Electron microscopy, Soil bacteria, Centrifugation, Soil microbiology, Soil fungi.

Identifiers: *Transmission electron microscopy, Culture media, Agromyces ramosus, Agars, *Lu-dox gradients.

Several procedures were evaluated for separating and concentrating indigenous microorganisms from soil without the occurrence of growth. The procedures included the use of Ludox gradients, simple and exhaustive centrifugal washing, and a two-phase polyethylene glycol system. The exhaustive centrifugal washing of soil was time consuming but yielded the greatest number of sectioned cells for viewing. Ludox gradients, on the other hand, were quite alkaline and provided plate counts that were two orders of magnitude less than those of other procedures. Electron microscopy of those of other procedures. Electron microscopy of nontangential, thin sections through the separated cells revealed that all of the cells examined were cells revealed that all of the cells examined were less than 0.9 millimicrons in diameter, and up to 72 percent were 'dwarf' cells less than 0.3 millimicrons in diameter. Some were small enough that they should not be resolved with the light microscope. Approximately 27 percent had a fine structure bearing some resemblance to that of a bacterial cyst or microcyst, but this value may be low because cells having their outer layers partially stripped off were not included in the count. Approximately 25 percent showed a distinct Approximately 25 percent showed a distinct periplasmic space, which often contained staina-ble material. Other fine structure features are presented together with frequencies of occurrence for the populations examined. (Mortland-Battelle) W72-12493

EFFECT OF TYPE OF ENRICHMENT AND DURATION OF INCUBATION ON SALMONELLA RECOVERY FROM MEAT-AND-BONE MEAL, Agricultural Research Service, Philadelphia, Pa. Marketing and Nutrition Research Div. For primary bibliographic entry see Field 05C. W72-12494

FLUORESCENT-ANTIBODY TECHNIQUES FOR THE IDENTIFICATION OF GROUP D STREPTOCOCCI: DIRECT STAINING

Massachusetts Univ., Waltham. Dept. of Environ-

Massachusetts Univ., Walland. 2011.
M. T. Pavlova, E. Beauvais, F. T. Brezenski, and W. Litsky.
Applied Microbiology, Vol. 23, No. 3, p 571-577, March 1972. 1 fig, 4 tab, 26 ref.

Descriptors: *Streptococcus, *Sewage, Cultures, Microscopy, Photography, Bioindicators, *Pollutant identification, Pathogenic bacteria, Anaerobic bacteria, Enteric bacteria, Water pollution sources, Fluorescence, E. coli, Salmonella. Identifiers: *Staining, *Fluorescent-antibody techniques, Serology, Precipitin tests, Biological samples, Biochemical tests, Feces, Globulin, Fluorescein isothiocyamte, Staphylococcus, Streptococcus liquefaciens, Streptococcus durans, Streptococcus durans, Streptococcus durans, Streptococcus faecalis.

rans, Streptococcus bovis, Streptococcus faecalis. Fluorescent-antibody (FA) techniques were employed in an attempt to develop a rapid test for the identification of group D streptococci. Fresh isolates were obtained from sewage and feces of sheep, cattle, horses, rabbits, chickens, geese, and rats. Identification to species was made by conventional physiological, biochemical, and serological tests. Both whole and disrupted cells of representative strains of each species were used for the preparation of the group D streptococcus vaccine. Globulin fractions of individual and pooled antisera were labeled with fluorescein isothiocyanate, and the resulting conjugates were tested with homologous and heterologous antigens. The specificity of the conjugates and staining was addressed by adsorption and inhibition tests utilizing controls with homologous and heterologous antigens. Employing the direct staining method and individual and pooled conjugates,

it was possible to obtain 84 and 85 percent positive FA reactions, respectively, with group D streptococcal strains. Trypsinization of the smears prior to staining eliminated all FA cross-reactions observed with non-group D streptococci and staphylococci. These findings suggest that the direct staining method will be of value in the rapid identification of group D streptococci. (Mortland-Battelle) Battelle) W72-12495

BACTERIAL CELL PRODUCTION FROM HEX-ADECANE AT HIGH TEMPERATURES, Wisconsin Univ., Madison. Dept. of Biochemistry. For primary bibliographic entry see Field 05B. W72-12496

BACTERIOPHAGES OF CLOSTRIDIUM BOTU-British Columbia Univ., Vancouver. Dept. of Microbiology. For primary bibliographic entry see Field 05B. W72-12497

TIME SERIES ANALYSIS OF WATER POLLU-TION DATA, Virginia Polytechnic Inst. and State Univ., Blacksburg. F. C. Fuller, Jr., and C. P. Tsokos. Biometrics, Vol 27, No 4, p 1017-1034, December 1971. 11 fig. 5 tab, 5 ref.

Descriptors: "Water pollution, "Statistical methods, "Time series analysis, Forecasting, Model studies, Statistical models, Water pollution control, "Dissolved oxygen, Light intensity, Biochemical oxygen demand, Temperature, Mathematical models, Mathematical studies, Equations, Water quality control, Correlation analysis, Water quality.

Techniques of time series analysis are presented for application to certain non-stationary water pollution data for a more effective analysis of such data and to be able to obtain better water quality. The technique of time series analysis was utilized in order to analyze certain dissolved oxygen water quality data. The dissolved oxygen concentration which exists in a stream while it is receiving an organic waste load is the variable by which the waste assimilation capacity of a stream is measured. Application to non-stationary time series provides forecast values and sample spectra for the observed dissolved oxygen series, which when in-terpreted lends insight into the mechanisms which generated the DO series. (Byrd-Battelle) W72-12498

THE INVERSE AUTOCORRELATIONS OF A TIME SERIES AND THEIR APPLICATIONS, North Carolina Univ., Chapel Hill. Dept. of Statistics.
For primary bibliographic entry see Field 07B.
W72-12499

A SHORT LIFE TEST FOR COMPARING A SAMPLE WITH PREVIOUS ACCELERATED TEST RESULTS, General Electric Co., Schenectady, N.Y. Research and Development Center. For primary bibliographic entry see Field 07B. W72-12500

AN IMPROVED HOLDER FOR THE DELVES MICROSAMPLING CUP, Perkin-Elmer Corp., Norwalk, Conn. For primary bibliographic entry see Field 02K. W72-12501

Group 5A—Identification of Pollutants

RESULTS OF THE ELEMENTAL PHOSPHOROUS MONITORING PROGRAM, LONG HARBOUR, NFLD. (JULY 1970-APRIL

Bedford Inst., Dartmouth (Nova Scotia). Marine **Ecology Lab**

For primary bibliographic entry see Field 05B.

FIVE NEW SPECIES OF CHLAMYDOMONAS, Wisconsin State Univ., La Crosse, Dept. of Biolo-

Journal of Phycology, Vol. 8, No. 1, p 120-126, March 1972. 23 fig, 24 ref.

Descriptors: *Systematics, *Chlamydomonas, Cultures, Chlorophyta, Protozoa, *Algae. Identifiers: Chlamydomonas isabeliensis, Chlamydomonas pallidostigmatica, Chlamydomonas fottii, Chlamydomonas texensis, Chlamydomonas pseudomicrosphaera, Culture media, Culturing techniques, Morphology, Flagellates.

Five new species of Chlamydomonas, C. isabeliensis, C. pallidostigmatica, C. fottii, C. pseudomicrosphaera and C. texensis were isolated into axenic culture during an investigation of green microalgae. The axenic cultures were maintained on Boldo Basal Medium (BBM) solidified with 1.5 percent agar and the morphology of the organisms studied with wet mounts and hanging drop slides from isolates on BBM agar or BBM liquid medium. Experiments were performed in a controlled environment culture room with temperature at 22 C and incident light provided by fluorescent bulbs. Supplementary attributes of the algae may serve as possible taxonomic aids. Morphological descriptions and culturing characteristics are given for each of the new species. (Snyder-Battelle) W72-12632

STUDIES ON THE BIOLOGY OF BROWN ALGAE ON THE ATLANTIC COAST OF VIR-GINIA. I. PORTERINEMA FLUVIATILE (PORTER) WAERN, Kent State Univ., Ohio. Dept. of Biological

Sciences.

R. G. Rhodes. Journal of Phycology, Vol. 8, No. 1, p 117-119, March 1972. 11 fig, 8 ref.

Descriptors: *Phaeophyta, *Tidal marshes, *Marine algae, Cultures, Salinity, Salt marshes, Systematics, *Virginia, *Atlantic Ocean, North America.

Identifiers: *Porterinema fluviatile, Culture media, Hummock Channel, Chloroplasts, Morphology, Epiphytes.

Porterinema fluviatile found as a microscopic filament on a culm of Spartina on the Atlantic Coast of Virginia, represents the first report of this marine alga in North America. The collection was made from a tidal marsh with water temperature of 19.5 C and salinity of adjacent water being 2.98 percent. Single filaments were isolated and placed into cultures containing modified Schreiber's solu-tion. Cultures were maintained at 20 plus or minus 1 degree C with continuous illumination from fluorescent lamps. Photographs were taken with bright field illumination and chloroplast morphology and number were examined in light passing through a Wratten Filter No. 48 (Eastman Kodak). er-Battelle) (Snyder-Ba W72-12633

RADIOISOTOPIC STUDY OF CALCIFICATION

IN THE ARTICULATED CORALLINE ALGA
BOSSIELLA ORBIGNIANA,
California Inst. of Tech., Pasadena. Div. of
Geological and Planetary Sciences.
For primary bibliographic entry see Field 05C. W72-12634

CONCENTRATION OF BROMIDE IONS IN SEAWATER BY ISOTOPIC EXCHANGE, Naval Ordnance Lab., White Oak, Md. For primary bibliographic entry see Field 05B.

THE DETERMINATION OF COPPER, LEAD, CADMIUM, NICKEL, ZINC AND COBALT IN NATURAL WATERS BY PULSE POLAROG-

RAPHY, Liverpool Univ. (England). Dept. of Oceanog-

raphy.
M. I. Abdullah, and L. G. Royle.
Analytica Chimica Acta, Vol. 58, No. 2, p 283-288,
February 1972. 1 tab, 15 ref.

Descriptors: *Polarographic analysis, Trace ei-ments, *Pollutant identification, Chemical analy-sis, Copper, Lead, Cadmium, Nickel, Zinc, Cobalt, Water analysis, Separation techniques, Heavy metals, Aqueous solutions, Methodology, Chelation, Electrolytes, Electrochemistry, Calci-um, Resins, Sea water, Freshwater, Calcium Descriptors: *Polarographic analysis, *Trace eleum, Resins, Sea water, Freshwater, chloride, Ammonia, Water quality control. Identifiers: *Pulse polarography, Sample preparation, Precision, Detection limits

A pulse-polarographic method for determining Cu, Pb, Cd, Ni, Zn, and Co in water from a single aliquot of a sample involved preconcentrating the metals on chelating resins in its calcium form. The eluate from the resin contains sufficient calcium to act as a supporting electrolyte for the subsequent polarographic analysis. After preconcentration, a 2.5 ml aliquot of the solution was pulse-polarog-raphed over the minus 0.2-minus 1.1 V range for rapned over the minus 0.2-minus 1.1 v range to Cu, Pb, and Cd analysis. Two-tenths ml of a previ-ously prepared standard containing 10 micro-grams/ml each of Cu, Pb, and Cd was then added and a second polarogram recorded. To the same solution in the cell a 2 M ammonia solution was added and a polarogram recorded from minus 0.8-minus 1.7 V for Ni and Zn, with a second polarogram being recorded after adding the Ni and Zn standard. Finally, 0.2 ml of a one percent alcoholic solution of dimethylglyoxime was added and polarographed between minus 1.1 and minus 1.5 V for cobal: and the Co standard was polarographed. The concentrations of the metals were calculated by measuring the peak heights and peak height increments after addition of the standards. Cor-rections were made for sample dilution caused by the addition of standards, ammonia, and dimethylglyoxime. Accuracy was evaluated by the analysis of spiked seawater samples which had been passed through the columns. Amounts detected and standard deviations seemed satisfactory for the rou-tine analysis of trace metals in natural waters. (Mackan-Battelle) W72-12640

A PRELIMINARY STUDY OF FRESH WATER FUNGI FROM ABACO ISLAND, BAHAMAS,

National Aeronautics and Space Administration, Houston, Tex. Manned Spacecraft Center. P. A. Volz, and E. S. Beneke.

Mycopathologia et Mycologia Applicata, Vol. 46, No. 1, p 1-3, January 26, 1972. 7 ref.

Descriptors: *Aquatic fungi, *Systematics, Freshwater, Wells, Basins, Islands, Cultures, Water quality, Plant growth.

Identifiers: Zoospores, Aphanomyces, Pythium debaryanum, Achyla bisexualis, Saprolegnia parasitica, *Abaco Island (Bahamas).

Seventy-five freshwater samples were collected from different areas on Abaco Island, Bahamas and taken to the laboratory for fungal isolation. Morphologic classification was accomplished by identification of encysted and germinated zoospores on sterile hemp seed cotyledons which had been submerged or floated on the sampled water after collection. Species recognitions were made primarily by the development of sexual structures.

Pythium, Achlya, Aphanomyces, and Saprolegnia were genera isolated from wells, natural rock basins, and dredged areas. It was concluded that reshwater on a small marine island can support fresh water fungi and that members of the Saprolegniales and Peronosporales can survive on organic matter found floating or submerged in shallow water. (Mackan-Battelle)

STUDY OF THE MICRODETERMINATION OF PHOSPHATE IN BIOLOGICAL PRODUCTS, (ETUDE DU MICRODOSAGE DES PHOSPHATES DANS DES PRODUITS BIOLOGIQUES), Institutul de Medicina si Farmacia, Iasi (Rumania).

Mikrochimica Acta, No. 1, p 68-73, 1972. 1 fig, 2 tab, 13 ref.

*Colorimetry, *Phosphates, Nutrients, Ultraviolet radia Methodology, Spectrophotometry. Ultraviolet radiation, Urine. Identifiers: *Biological samples, Photocolorimetry, Blood, Phosphomolybdic acid,

A study has been made of the methods for the determination of phosphate in biological products and a new method has been worked out that is based on the formation of yellow/phosphomolyb-dic acid, which is subjected to photocolorimetry in the ultraviolet region in a water-acetone medium. The proposed procedure has been verified on blood and urine, in the absence or presence of additional phosphate. The error varies between 0 and 1 percent with a mean value of plus or minus 0.45 percent. (Mortland-Battelle) W72-12642

THE DETERMINATION OF LEAD, CADMIUM, COPPER, THALLIUM, BISMUTH AND ZINC IN BLOOD SERUM BY THE METHOD OF ANODIC STRIPPING-POLAROGRAPHY, (DIE BESTIMMUNG VON BLEI, CADMIUM, KUPFER, THALLIUM, WISMUT UND ZINK IM BLUTSERUM IM WEGE DER A NODIC-STRIPPING-POLAROGRAPHIE), Kemijski Institut Boris Kidric, Ljubljana (Yu-

goslavia). I. Sinko, and S. Gomiscek.
Mikrochimica Acta, No. 2, p 163-172, 1972. 5 fig, 30 ref. English summary.

Descriptors: *Trace elements, *Polarographic analysis, Lead, Cadmium, Copper, Zinc, Poisons, Heavy metals, Degradation (Decomposition), Electrochemistry, Pollutant identification, Chemi-

acal degradation.
Identifiers: *Anodic stripping polarography,
*Biological samples, *Serum, Bismuth, Thallium,
Detection limits, Blood, Sample preparation, Precision.

Sample preparation in the anodic-stripping polarographic method for the analysis of blood serum for Pb, Cd, Cu, Tl, Bi, and Zn involves decomposing a 0.5 ml blood serum sample with 0.5 ml nitric acidperchloric acid (3:1) in a teflon autoclave. The detection limit is 0.01 microgram metal in 1 milliliter of blood serum. The analysis requires six hours if the depolarizer concentration is determined by means of the standard addition method. The variation coefficient amounted to 7.5 and 11 percent, respectively, for copper and zinc for the blood serum specimen which contained 1.0 microgram copper, 0.7 microgram zinc, 0.016 microgram lead and less than 0.01 microgram cadmium, thallium and bismuth per ml. (Mackan-Battelle) W72-12646

SENSITIVITY OF THE C-1402 RADIOMETRIC METHOD FOR BACTERIAL DETECTION, Johnston Labs., Inc., Cockeysville, Md.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants-Group 5A

Applied Microbiology, Vol. 23, No. 1, p 198-199, uary 1972. 1 fig, 4 ref.

Descriptors: *Pollutant identification, *Radioactivity techniques, *Pathogenic bacteria, Cultures, Carbon radioisotopes, Carbon dioxide, E. coli, Coliforms, Enteric bacteria, Pseudomonas, Salmonella, Streptococcus, Radiochemical analysis,

monetta, Streptococcus, Radiocnemicai analysis, Radiosensitivity. Identifiers: *Sensitivity, C-14, Culture media, Staphylococcus aureus, Proteus vulgaris, Pseu-domonas aeruginosa, Staphylococcus epidermidis, Enterobacter cloacae, Streptococcus pyogenes, Salmonella typhimurium, Detection limits

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Serial dilutions of each of eight common bacterial species (E. coli, Staphylococcus aureus, Proteus vulgaris, Streptococcus pyogenes, Pseudomonas aeruginosa, Staphylococcus epidermidis, Salmonella typhimurium, Enterobacter cloacae) were monella typhimurium, Enterobacter cloacae) were prepared by inoculating 1-ml samples into a vial of 9ml tryptic soy broth with its dextrose replaced by 0.5 microcuries of C-14-labeled glucose. After shaking, 1 ml was serially diluted for a total of 11 vials. From at least 3 vials 0.5 ml volumes were pour plated with 15 ml TSA, incubated 48 hr, and the colonies counted. The vials were placed in the BACTEC 225, stirred continuously, incubated at 35 C, and gas samples (C-14-labelled CO2) automatically taken hourly to measure radioactive content. Detection corresponded to a release of less than 1 percent of the C-14 activity of the vial; i.e., a Growth Index of 20 units. The detection time was considered to be the interval between inoculation and detection, the times being related to the tion and detection, the times being related to the initial inoculum, in colony-forming units (CFU), by the colony counts. Plotted results show a linear relation between the logarithm of the initial inocu-lum and the detection time. High sensitivity, down to one CFU, was demonstrated. (Mackan-Battelle) W72-12648

CHROMATOGRAPHIC SEPARATION OF MOLYBDENUM USING AN ALIPHATIC ALPHA-HYDROXY OXIME, lows State Univ., Ames. Inst. for Atomic Research; and Iowa State Univ., Ames. Dept. of

Chemistry.

Analytical Chemistry, Vol 44, No 4, p 692-694, April 1972. 2 fig, 3 tab, 7 ref.

Descriptors: Molybdenum, Separation techniques, Ions, Organic compounds, Resins, Iron, Nickel, Cobalt, Zinc, Copper, Cadmiun, Nuclear magnetic

Mercury, Aqueous solutions, Nuclear magnetic resonance, Chelation, Heavy metals. Identifiers: *Alpha-hydroxy oximes, Tin, Tungsten, Thorium, Elution, Column extraction chromatography, Aliphatic hydrocarbons, Metal chelates, Infrared spectroscopy, Chemical recovery.

By using either of two-alpha hydroxy oximes (10-hydroxyeicosan-9-one oxime (HEO) or 5,8-diethyl-7-hydroxydodecan-6-one oxime (DHDO)) in tobene solution, it is possible to selectively ex-tract molybdenum (IV) from acidic aqueous solution. Molybdenum was separated from each of 10 different metal ions by elution through a macroreticular resin bed impregnated with the oxmacrotectular resin bed impregnated with the ox-ines. The oxime solutions form complexes with molybdenum (IV) rather than the other ions, thereby allowing its separation and characteriza-tion by nuclear magnetic resonance and infrared spectroscopy. Elution through the column therespectroscopy. Elution through the column therefore produces an oxime-molybdenum complex bound to the resin and the separated metal in the eluate. Metals paired with Mo and chromatographed were Fe, Ni, Co, Zn, Cu, Sn, W, Cd, Hg, and Th. Recoveries averaged 99.4 percent for Mo and 99.8 percent for the other metals on HEO and 99.1 percent Mo, 100.2 percent, for the ions on DHDO columns. Thus it appears that hydroxy oxim-s permit quantitative separation of Mo (IV) from many other metal ions. (Mackan-Battelle) W72-12649 STREAM INSECTICIDE MONITORING STU-

DIES, BERRIEN COUNTY, MICHIGAN OC-TOBER 1968 THRU JULY 1970, Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management. For primary bibliographic entry see Field 05B. W72:1968.

STUDIES ON THE PERSISTENCE OF SOME CARBAMATES INSECTICIDES IN THE AQUATIC ENVIRONMENT I: HYDROLYSIS OF SEVIN, BAYGON, PYROLAN AND DIMETILAN IN WATERS,

National Research Center, Cairo (Egypt). Water

Pollution Dept. For primary bibliographic entry see Field 05B. W72-12651

A CONTINUOUS METHOD OF MONITORING WATER QUALITY BY CHLORINE CONSUMP-TION UNDER ULTRAVIOLET RADIATION, Government Chemical Industrial Research Inst.,

T. Kobayashi, and T. Okuda. Water Research, Vol 6, No 2, p 197-209, February 1972. 6 fig, 4 tab, 8 ref.

Descriptors: *Water quality, *Monitoring, *Ultraviolet radiation, *Chlorine, Aqueous solutions, Organic acids, Organic compounds, Chemical oxygen demand, Electrodes, Electrolysis, Instrumentation, Pollutant identification, Chemical reac-tions, Water pollution, Amino acids, Methodolo-gy, Volumetric analysis, Irradiation, Car-bohydrates, Pollutants, Alcohols, Phenols, Ureas, Ammonia, Catalysts, Mercury, Lead, Salts, Auto-mation, Equipment, Solvents, Water analysis,

Identifiers: *Coulometric titration, *Am-perometry, *Consumption, Chemical interference, Aliphatic hydrocarbons, Ion selective electrodes, Organic solvents, Formic acid, Propionic acid, n-Butyric acid, Oxalic acid, Glutaric acid, Adipic acid, Fumaric acid, Glyconic acid, DL-Lactic acid, D-Tartaric acid.

A continuous coulometric titration apparatus in which water samples are titrated with electrolytically generated chlorine under irradiation with UV cally generated chlorine under irradiation with UV light has been constructed for the monitoring of polluted waters. Chlorine is continuously produced by electrolysis of 1 M HCl in an external generator cell, and the chlorine-HCl mixture and sample are fed at fixed rates to a stirred-tank reactor and mixed together under UV irradiation. The chlorine concentration in the chlorine-HCl sample water mixture is continuously detected am-perometrically. Based on the samples examined, two kinds of electrode systems are utilized in the amperometric detection of chlorine: (1) rotating Pt microelectrode and Pt auxiliary electrode for compounds without amino groups; (2) gaseous-chlorine detector with Pt and Ag-AgCl electrodes separated by a KCl-agar bridge and 2 M-KCl-0.2
M-phosphate buffer of 6.1 for amino group-containing compounds and river water samples. Examinations have been made on aqueous solutions of 51 compounds and on raw waters at a water purification plant. Combination of chlorine and ultraviolet light permits far more rapid consumption of chlorine for various organic compounds than in the case of mere contact of chlorine and organic compounds in the dark. The proportionality and additivity of chlorine consumption data in mixed solutions were obtained only in low substrate concentrations. As the catalysts (or photosensitizers) in this method mercury (II) and lead (II) salts were found effective. (Holoman-Battelle) W72-12652

THE SEDIMENT-INHABITING TESTATE AMOEBAE (RHIZOPODA, TESTACEA) FROM THE FINSTERTALER SEEN (TYROL/AUSTRIA), (SEDIMENTBEWOHNENDE

SCHALENAMOBEN RHIZOPODA, TESTACEA) DER FINSTERTALER SEEN (TIROL), Biological Station, Lunz am See (Austria).

H. Laminger. Archiv fur Hydrobiologie, Vol 69, No 1, p 106-140, August 1971. 17 fig, 8 tab, 18 ref.

Descriptors: *Systematics, *Protozoa, Sediments, Lakes, *Lake sediments, Invertebrates, Aquatic

annuais.

Identifiers: *Amoebae, *Austria, *Finstertaler Seen, Centropyxis spp, Cyphoderia ampulla, Difflugia spp, Euglypha aspera, Lesquereusia modesta, Microchlamys patella, Phryganella nidulus, Pontigulasia spectabilis, Sphenoderia lenta, Trinema enchelys, Trinema lineare.

Sixty species of testate amoebae were recovered from the sediment of an Austrian high-mountain lake (Finstertaler Seen). Forty-one species had not been previously identified in Austria, and six were new: Centropyxis adami, Centropyxis austriac, Centropyxis janetscheki, Diffugia finstertaliensis, Diffugia lebes var. bretschkoi, and Diffugia mammella. (Synder-Battelle)

THE POLAROGRAPHIC ESTIMATION OF BAYLUSCIDE,

NATIONALIDE, National Research Centre, Cairo (Egypt). T. M. H. Saber, and M. M. Sidky. J Chem U. A. Vol 13, No 3: p 369-373, 1970. Illus. Identifiers: Pollutant identification, *Bayluscide, *Molluscicide, *Polarographic analysis.

Details of the conditions under which Bayluscide compound, a molluscicide, can be estimated polarographically are given.—Copyright 1972, Biological Abstracts, Inc. W72-12664

AN ANNOTATED BIBLIOGRAPHY OF ATTEMPTS TO REAR THE LARVAE OF MARINE FISHES IN THE LABORATORY,

Scripps Institution of Oceanography, La Jolla,

For primary bibliographic entry see Field 05C.

SUBLITTORAL ECOLOGY OF THE KELP BEDS OFF DEL MONTE BEACH, MONTEREY, CALIFORNIA, Naval Postgraduate School, Monterey, Calif.

C. S. Minter, III.

Available from the National Technical Informa-tion Service as AD-738 875, \$3.00 in paper copy, \$0.95 in microfiche. Master's Thesis, September 1971. 181 p, 102 fig, 31 ref, 2 app.

Descriptors: *Baseline studies, *Kelps, *Biological communities, *California, Benthos,

Consumenties, California, Benthos, Ecosystems, Aquatic habitat, Food chains, Aquatic populations.

Identifiers: *Benthic ecology, *SCUBA, *Diving, *Marine ecology, Kelp beds, Marine benthos, Underwater studies, Harbor ecology, Monterey breakwater study.

Macroscopic organisms collected by SCUBA divers throughout a large portion of the kelp beds at Del Monte Beach, Monterey, California, were identified and a list of species present was compiled. More than 160 such species were found to exist. Collection methods and techniques utilized by divers were documented. Numerous underwater photographs were taken. A population census and mapping survey was made by divers of the benthic flora and fauna existing within two the benthic flora and fauna existing within two permanently marked bottom areas, one of which is to be eventually isolated from the open sea by erection of a breakwater. The areas were found to be of generally similar biological population, but of markedly different species distribution and rela-tive abundance. (Katz-Washington)

Group 5A—Identification of Pollutants

MARINE FOULING ORGANISMS IN MON-TEREY HARBOR, CALIFORNIA, JUNE THROUGH SEPTEMBER 1966, Naval Postgraduate School, Monterey, Calif. T. L. Miller.

Available from the National Technical Informa-tion Service as AD-805 628, \$3.00 in paper copy, \$0.95 in microfiche. M.S. Thesis, U.S. Naval Post-graduate School, 1966. 54 p, 14 fig, 3 tab, 17 ref,

Descriptors: *Fouling, *Bottom fauna, *Pacific coast region, *Invertebrates, Marine animals, Animal grouping, On-site tests, Season, Annual succession, California, Worms.
Identifiers: *Marine fouling organisms, *Test panels, *Barnacles, Monterey Harbor (Calif), Bryozoans, Serpulids, Hydroids, Phoronid

Marine fouling organisms occurring on test panels of various substances and at various locations and depths of the Monterey Harbor, California, were studied for identification and significance. Some panels were immersed for the entire length of the study-June 10 to September 16, 1966; others, mainly plywood, were immersed only for month-long periods throughout the study. Barnacles, bryozoans, and serpulids were the major fouling organisms in the inner harbor, while hydroids were most significant in the outer harbor. The barnacles reached maximum attachment in June and July, but were covered later by bryozoans. Phoronid worms were abundant in August and September on the shallow panels in the inner harbor. Fouling increased with depth and distance away from direct sunlight. Fibrous masonite and wood panels were the best collectors, and stainless steel was the west (Vot. Westington). the worst. (Katz-Washington)

THE GROWTH AND SURVIVAL OF PLANTED CLAMS, MERCENARIA MERCENARIA, ON THE GEORGIA COAST,

Georgia Game and Fish Commission, Brunswick.

Marine Fisheries Div. W. F. Godwin.

Available from the National Technical Informa-tion Service as COM-72-10318, \$3.00 in paper copy, \$0.95 in microfiche. Georgia Game and Fish Comm., Marine Fisheries Division Contribution Series No. 9, September 1968. 16 p, 8 fig, 2 tab, 3 ref. Bur. of Commercial Fisheries 2-44-R.

Descriptors: *Marine fisheries, *Clams, *Growth, *Survival, *Aquiculture, Fisheries, Fishing, Aquatic animals, Mortality, Georgia, Atlantic Ocean, Commercial shellfish, Mollusks, Shellfish. Identifiers: Planting (Clams), Quahog, Mercenaria

Approximately 4,000 small laboratory-reared hard clams were artificially planted in six locations in St. Simonds Sound, a Georgia coast estuary. The excellent growth of planted clams suggests that protected areas of proper salinity and of proper bottom types could support planted clams in very bottom types count support painted claims in very high densities. Experiments showed the planted claims must be protected to reduce predation by the blue crab. The cost of providing wire screening was thought to be prohibitive. (Katz-Washington) W72-12672

POLYCHLORINATED BIPHENYLS AND OR-GANOCHLORINE PESTICIDES IN SOME FRESHWATER AND MARINE FISHES, Fisheries Research Board of Canada, St. Andrews (New Brunswick). For primary bibliographic entry see Field 05C. W72-12679

NATURAL ABUNDANCE OF THE STABLE ISOTOPES OF CARBON IN BIOLOGICAL

SYSTEMS,
Texas Univ., Austin. Dept. of Botany.
For primary bibliographic entry see Field 05B.

W72-12709

LEAD IN A CONNECTICUT SALT MARSH. Yale Univ., New Haven, Conn. School of Forestry. For primary bibliographic entry see Field 05B. W72-12710

PLANNING AND IMPLEMENTATION OF REMOTE SENSING EXPERIMENTS, Texas A and M Univ., College Station. Remote Sensing Center.

For primary bibliographic entry see Field 05B. W72-12712

LABORATORY EVALUATION OF RESIDUES MAINTAINED IN WATER TREATED WITH POLYVINYL CHLORIDE FORMULATIONS OF DURSBAN (TRADEMARK),

Army Environmental Hygiene Agency, Edgewood Arsenal, Md.

For primary bibliographic entry see Field 05B. W72-12713

LABORATORY RELEASE RATE STUDIES OF DIAZINON AND SUPRACIDE (TRADEMARK) FROM POLYVINYL CHLORIDE FORMULA-TIONS.

Army Environmental Hygiene Agency, Edgewood Arsenal, Md. For primary bibliographic entry see Field 05B. W72-12714

INTERPRETATION OF ISOPOTENTIAL POINTS: THE COMMON INTERSECTION IN OF FAMILIES CURRENT-POTENTIAL

CURVES, State Univ. of New York, Buffalo. Dept. of

D. F. Untereker, and S. Bruckenstein. Analytical Chemistry, Vol 44, No 6, p 1009-1020, May 1972. 6 fig, 12 ref.

Descriptors: *Electrodes, *Oxidation-reduction potential, Instrumentation, *Spectrophotometry, Gold, Mathematical studies, *Electrochemistry, Copper, Oxidation, Chemical analysis, Adsorption, Metals, Chemical reactions, Electrical properties, Electric currents, Iodine, Ions, Sulfates, Iodides, Zeta potential.

Identifiers: *Isopotential points, Platinum electrode, Sulfites, Platinum, Current-potential curves, Data interpretation.

Studies of surface processes at solid electrodes show that it is possible to predict the occurrence of isopotential points in families of i-E curves obtained under potential scanning conditions. A common intersection point can occur if the the potential scanning program is the same for all curves. The electrode surface is partially covered with at least one adsorbed or deposited species whose initial amount is different for each curve, and the electrode surface behaves as two independent electrochemical regions, the sum of whose areas is constant at all times for all of the current-potential curves. These conclusions were reached from experiments of adsorbed SO2 on platinum, oxidation of thin copper films on platinum, and oxidation of a platinum electrode with both adsorbed SO2 and iodide. The isopotential point theory yields valuable information on the nature of an electrode surface. The occurrence and stoichiometry of surface reactions can be established using the disappearance of an isopotential point with increasing coverage of adsorbate. The existence of an unexpected intermediate adsorbate can also be established, and the presence of adsorable impuri-ties can be verified. (Mortland-Battelle) W72-12715 SELF-BALANCING BRIDGE FOR FERENTIAL CAPACITANCE MEA DIF-MEASURE-MENTS, Wayne State Univ., Detroit, Mich. Dept. of

For primary bibliographic entry see Field 07B. W72-12716

PULSED NUCLEAR MAGNETIC RESONANCE MEASUREMENT OF RELAXATION TIMES IN ION-EXCHANGE RESINS,

Wisconsin Univ., Madison. Dept. of Chemistry. W. J. Blaedel, L. E. Brower, T. L. James, and J. H.

Analytical Chemistry, Vol 44, No 6, p 982-985, May 1972. 4 fig.

Descriptors: *Ion exchange, *Resins, Molecular Moisture content.
Identifiers: *Relaxation times, *Pulsed nuclear

magnetic resonance, Protons, Cross linkages.

Pulsed NMR techniques have been applied to the measurement of longitudinal and transverse relax-ation times (T sub 1 and T sub 2) in ion exchange resins of various water contents and cross linkages. Dowex 50-W ion exchange resin was used in all measurements, with 200-400 mesh size and with cross-linkings of 2, 4, 8, and 12 percent DVB. The moisture content ranged from fully swollen to less than one mole of water per exchange site. Relaxation time resourcements were made at according tion time measurements were made at normal equilibrium probe temperatures for the instrument and at one observation frequency of 1500 4 KHz. The lowest relaxation time as calculated by linear regression analysis was around 0.1 msec. Cross-linking affects T sub 1 and T sub 2 for water protons only slightly. For water contents above 6 moles of water per exchange site, T sub 1 and T sub 2 became independent of water content, indicating a water-like environment for the water protons. Below 6 moles of water per exchange site, the relaxation times indicate that the water is structured. This work shows that the relaxation properties of ion exchange resins can be studied easily by pulsed NMR techniques, and that the relaxation times give information on the molecular structure of the resins. (Synder-Battelle) W72-12717

USE OF ELECTRON SPIN RESONANCE TO CHARACTERIZE THE VANADIUM (IV)-SU-LFUR SPECIES IN PETROLEUM, Gulf Research and Development Co., Pittsburgh,

F. E. Dickson, C. J. Kunesh, E. L. McGinnis, and

L. Petrakis. Analytical Chemistry, Vol 44, No 6, p 978-981, May 1972. 2 fig, 4 tab, 18 ref.

Descriptors: Oil, Cations, *Sulfur, *Pollutant identification, Chemical analysis, Trace elements, Oil pollution, Chromatography, Heavy metals,

Sotropy, Resonance.

Identifiers: *Electron spin resonance spectrometry, *Oil characterization, *Vanadium, Porphyrins, Complexation, Asphaltenes, Petroleum. Petroleum residues.

A series of his (dithiocarhamato) oxo-vanadium (IV) complexes have been prepared and analyzed for their electron spin resonance in a series of solvent, varying the dielectric constant and coordinating ability. Isotropic g sub o values and hyperfine coupling constants were examined for these environments and for several vanadium-sulfur complexes in order to characterize these species in spectrometric analysis. Data on fractions of petroleum residuals, separated chromatographi-cally to concentrate polar and nonpolar materials, have revealed that the difference in their ESR parameters are valid and can be used for chemical identification of the complexes. The data also suggest an application of the method to the analysis of

the nonporphyrin vanadium (IV) complexes in petroleum. (MackaniBattelle) W72-12718

DETERMINATION OF TRACE AMOUNTS OF CHROMIUM (III) USING CHEMILU-MINESCENCE ANALYSIS, Environmental Protection Agency, Athens, Ga.

Southeast Water Lab.

W. R. Seitz, W. W. Suydam, and D. M. Hercules.

Analytical Chemistry, Vol 44, No 6, p 957-963,

May 1972. 11 fig., 4 tab.

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spens of Descriptors: *Trace elements, *Chromium, *Pollutant identification, Heavy metals, Cations, Chemical reactions, Light intensity, Water analysis, Cobalt, Strontium, Chelation, Iron, Lead, Magnesium, Calcium, Zinc, Manganese, Aluminum, Nickel, Copper, Mercury, Cadmium, Oxidation, Chemical analysis.

Identifiers: *Chemiluminescence, Detection limits, Chemical interference, Luminol, EDTA, Tin, Vanadium, Hydrogen peroxide, 5-amino-2 3-

Tin, Vanadium, Hydrogen peroxide, 5-amino-2 3-dihydrophthalazine-1 4-dione, Complexation,

Since metal ions catalyze the oxidation of luminol (5-amino-2,3-dihydrophthalazine-1, 4-dione) by hydrogen peroxide basic aqueous solutions and the intensity of light emission is proportional to the metal catalyst concentration in the presence of excess reagents, the intrinsic sensitivity of this system can be used for trace metal analysis. The luminol system applied to Cr (III) detection employs the delivery of peroxide, the luminol base, and a volume of the sample into a special reaction cell into which nitrogen is bubbled to act as a mixer. The intensity of the resulting luminescent reaction is monitored and recorded. Light emission catalyzed by other metals is quenched by adding EDTA to form non-catalytic complexes. The Cr (III)-EDTA complex is slow to form and allows the chemiluminescent reaction to occur. This method was successively applied to several natumethod was successively applied to several natural water samples with no sample pretreatment required. Analysis time was less than 30 min with a reported detection limit for Cr (III) of 0.5 picomoles (about 0.025 ppb). The minimum detectable quantity was 25 picograms with a linear response up to one micromole. Of the 18 cations checked for interference only 4 - Sn (IV), Co (II), Fe (II) - affect luminescence, and these can be compensated for by running a blank. (Mackan-Battelle) W72-12719

IMPROVED PROCEDURES FOR THE DETER-IMPROVED PROCEDURES FOR THE DETERMINATION OF OXYTETRACYCLINE IN MILK, MILK PRODUCTS; CHICKEN MUSCLE, LIVER; AND EGGS, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.

S. E. Katz, and C. A. Fassbender.

Bulletin of Environmental Contamination and Toxicology, Vol 7, No 4, p 229-236, April 1972. 8 tab. 6 ref.

Descriptors: *Antibiotics (Pesticides), *Analytical techniques, *Evaluation, *Pollutant identification, *Milk, *Poultry, Organic pesticides, Methodology, Centrifugation, Bioassay, Pesticide residues, Methodology, Foods.

Identifiers: *Biological samples, *Oxytetracycline, Milk products, Tissues, Muscle, Liver, Eggs, Detection limits, Bioaccumulation, Recovery, Chlortetracyline.

The improved procedures for determining oxytetracycline in milk and dairy products, chicken muscle tissue and livers, and eggs are evaluated. The procedures used were based upon those developed for chlortetracycline in similar materials and are compared to the procedures listed in the FDA compendium of methods and protocols. The procedural improvements include pH adjustment, centrifugation, single agar layer, high temperature seeding and spreading of agar, and the use of a surfactant. A summary of the detection limits and analytical measurement for the individual procedures shows that the centrifuge modification, pH adjustment where applicable, and the use of surfactant when necessary have significantly improved the ability to measure residues of oxytetracycline in milk, eggs, and chicken tis-sue. (Holoman-Battelle) W72-12721

MASS SPECTRAL PATTERN OF MIREX (DODECACHLOROOCTAHYDRO-1, 3, 4-METHENO-2H-CYCLOBUTA (CD) PENTALENE) AND OF KEPONE TALENE) AND OF (DECACHLOROOCTAHYDRO-1,3,-4-METHENO-2H-CYCLOBUTA 4-METHENO-2H-CYCLOBOTA (CD)-FEN-TALEN-2-ONE) AND ITS APPLICATION IN RESIDUE ANALYSIS, Georgia Univ., athens. Dept. of Entomology. S. Uk, C. M. Himel, and T. F. Dirks. Bulletin of Environmental Contamination and

Toxicology, Vol 7, No 4, p 207-215, April 1972. 4 fig, 1 tab, 8 ref.

Descriptors: *Pesticide residues, *Mass spectrometry, *Pollutant identification, Chemical analysis, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Chlorine Polychlorinated biphenyls, Chlorine radioisotopes, Ionization, Pesticide kinetics, Separation techniques, Gas chromatography, Heptachlor, Phenolic pesticides, Ions. Identifiers: *Mirex, *Kepone, Chemical interference, *Mass spectra, Hexachloro-cyclopentadiene, Aroclor 1254, Aroclor 1260, Dodecachlorooctahydro-1 3 4-metheno-2H-cyclobuta (cd)pentalene, Decachlorooctahydro-1 3 4-metheno-2H-cyclobuta (cd)-pentalen-2-one, Heptachlor epoxide, Chlordane, Nonachlor, Chlordene, Cl-35, Cl-37.

Mass spectrometry can be used successfully to identify pesticide residues which produce over-lapping late eluting gas chromatography peaks. The mass spectra of Mirex and Kepone were taken at ionization energies of 10 and 80 electron volts with a Bell-Howell model 21-490 mass spectrometer in a preliminary application of the method. It was difficult to distinguish true peaks from the background at m/e less than 100, but both insecticides yielded strong peaks at m/e 270 correspond-ing to the positively charged hexachloro-cyclopen-tadiene. At 10 eV, most peaks disappeared leaving the parent, m/e 270, and the m/e 235 peaks. The use of clusters of isotope peaks at m/e 270 and m/e 235 and the molecular ions (m/e 540 for Mirex and m/e 486 for Kepone) has been suggested as characteristics for identification. Kepone requires, in addition, the isotope clusters at m/e 216. The m/e 270 and m/e 235 fragments are not free from interference. The chlordane and heptachlor series of insecticides produce these two groups of ions. Nevertheless, their parent molecular ions are clear from overlapping with any fragment of Mirex or Kepone; chlordane, m/e 406; nonachlor, m/e 440; chlordene, m/e 336; heptachlor, m/e 370; hep-tachlor epoxide, m/e 386. (Holoman-Battelle) W72-12723

SKEWED ALGAL DIVISION PATTERNS: EF-FECTS OF AUTOSPORE YIELD ON COM-PUTED SYNCHRONY INDICES, Saint Louis Univ., Mo. Dept. of Biology. D. W. Rooney.
Mathematical Biosciencies, Vol 12, No 3/4, p 367-

373, December 1971. 2 fig, 3 ref.

Descriptors: *Mathematical studies, *Algae, Equations, Biological properties, Reproduction, Analytical techniques, Numerical analysis, Model studies, Computers, Cultures. Identifiers: *Division patterns, *Autospores, *Synchronous cultures, Synchrony index.

Reported are algebraic and numerical analyses of the algal division synchrony index S sub T which reflects the degree of nonlinearity of plots of log cell number versus time. It has been found that for kewed distributions of division times, S sub T is affected by the number of autospores produced per division. A new algal division synchrony index S sub R is presented. For a culture of any given au-tospore yield. S sub R reflects the nonlinearity of a semilogarithmic plot versus time of cell number in a culture of identical division time pattern yielding two autospores per division. The index S sub R, independent of autospore yield for any division time distribution, assumes higher values for distribu-tions skewed toward longer times than for op-positely skewed distributions. (Mackan-Battelle) W72-12724

PHYTOPLANKTON PIGMENTS IN PORTO NOVO WATERS (INDIA), Center of Advanced Study in Marine Biology,

Porto Novo (India). K. Krishnamurthy.

Internationale Revue der Gesamten Hydrobiologie, Vol 56, No 2, p 273-282, 1971. 5

Descriptors: *Phytoplankton, *Pigments, *Chlorophyll, Salinity, Water temperature, Sampling, Turbidity, Analytical techniques, Spectrophotometry, Diatoms, Dinoflagellates, Seasonal, Filtration, Pyrrophyta, Cyanophyta, Euglena, Euglenophyta, Chrysophyta,

Euglena, Custophyta, Chirophyta, Identifiers: *Carotenoids, *Porto Novo (India), Chlorophyll a, Chlorophyll b, Chlorophyll ceratium, Peridinium, Dinophysis, Gymnodinium, Noctiluca, Chaetoceros, Coscinodiscus, Cylindrotheca (Nitzschia), Rhizosolenia, Skeletonema, Thalassicatibris, T Pleurosigma, Eucampia, Thalassiothrix, Thalassionema, Triceratium, Biddulphia, Oscillatoria, Spirogyra, Peredinin, Fucoxanthin.

concentration and seasonal cycle phytoplankton pigments in backwater and in the water of adjoining mangrove forests in Porto Novo (India) were studied. Salinity and water temperature were also measured. For pigment estimation, oxoid membrane filters were used. Before fil-tration, 1 ml of 1 percent magnesium carbonate suspension was added to the filter and sucked dry suspension was added to the filter and sucked dry in a Millipore filtration unit. Replicates were run and acetone extracts of pigments were prepared using a spectrophotometer. The pattern of seasonal events in the occurrence of pigments for the two regions was almost identical. However, chlorophyll a was higher in backwater, and chlorophylls b and c, and carotenoids were higher in the mangrove forest waters. During January to July, pigment values generally showed an upward trend with the primary peak of chlorophyll a occurring during July. The major carotenoids found were peridinin and fucoxanthin. (Mortland-Battelle) W72-12725 W72-12725

MERCURY ACCUMULATION IN FOOD CHAINS, Swedish Water and Air Pollution Research Lab., For primary bibliographic entry see Field 05B. W72-12730

CULTIVATION AND GROWTH OF TWO PLANKTONIC OSCILLATORIA SPECIES, Max-Planck-Institut fuer Limnologie zu Ploen (West Germany). For primary bibliographic entry see Field 05C. W72-12740

THE USE OF BLUEGILL BREATHING TO DE-TECT ZINC, Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.

Group 5A-Identification of Pollutants

J. Cairns, Jr., and R. E. Sparks. Copy available from GPO Sup Doc EP2.10:18050 EDQ 12/71, \$0.55; microfiche from NTIS as PB-211 332, \$0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1971. 45 p, 1 fig, 14 tab, 15 ref. EPA Program 18050 EDQ 12/71.

Descriptors: *Zinc, *Bioindicators, *Water pollution effects, Sunfishes, Respiration, Toxicity, Lethal limit, Reproduction, Growth rates, Spawning, Monitoring, Industrial wastes, Bioassay, Sulfates, Fish physiology, Water pollution control, Water pollution sources, Heavy metals,

Fishkill, Flow rates, Inhibitors.
Identifiers: *Bluegills, *Breathing, Biological samples, Zinc sulfate, Lepomis macrochirus.

The presence of zinc at concentrations of 8.7, 5.22, 4.16, and 2.55 mg/l in dechlorinated municipal tap water was detected by an increase in breathing rate or a change in breathing rate variance of bluegills. None of the fish exposed to the three lower concentrations died during the experiments. The criterion for detection was an arbitrary number of responses occurring at the same time. When the criterion was changed from a single response to three responses occurring at the same time, the number of false detections ('detections occurring before zinc addition) decreased, but the lag between zinc addition and detection increased. Zinc concentrations of 0.025 and 0.075 mg/l (approximately 1/100 and 1/34 of 2.55 mg/l, respectively) did not appear to affect the reproduction and growth of bluegills in the laboratory, but 0.250 mg/l zinc (approximately 1/10 of 2.55 mg/l) inhibited spawning in ripe bluegills and killed newlyhatched fry. An in-plant system for the prevention of fishkills caused by spills could be developed by monitoring several biological functions of fish simultaneously to obtain informational redundancy and reduce error; by exposing test fish to higher waste concentrations than occur in the receiving stream as a safety factor; automating the collection and analysis of data to reduce lag time; and by choosing appropriate criteria for detection. (See also W72-12742) (Mortland-Battelle) W72-12741

THE USE OF FISH MOVEMENT PATTERNS TO MONITOR ZINC,

Virginia Polytechnic Inst. and State Univ. Blacksburg. Center for Environmental Studies. For primary bibliographic entry see Field 05C. W72-12742

BIODEGRADATION OF NITROLOTRIACETIC ACID AND RELATED IMINO AND AMINO ACIDS IN RIVER WATER, Monsanto Co., St. Louis, Mo. For primary bibliographic entry see Field 05B.

DICHOTOMOSIPHON IN FLORIDA SPRINGS. Florida Univ., Gainesville. Dept. of Botany. J. S. Davis, and W. F. Gworek.

Journal of Phycology, Vol 8, No 1, p 130-131,

March 1972. 6 ref.

Descriptors: *Chlorophyta, *Springs, Diatoms, Biota, Protozoa, *Amphipoda, *Florida, Streams, Isopods, Scenedesmus, Aquatic habitats, Classifi-

cation, Aquatic algae.
Identifiers: *Dichotomosiphon tuberosus. *Epiphytes, Growth media, Cocconeis placentula, Closterium, Gomphonema longiceps, Cymbella,

Dichotomosiphon and its associated biota were obtained from several Florida springs. Collections were made several times by diving with scuba equipment and wading. To aid in identification, pieces of the Dichotomosiphon mat were placed in 3 different growth media: soil and water, spring water, and a defined mineral medium. They were

incubated at 70F under florescent light (350 ft-C intensity with a 16 hr-light, 8 hr-dark cycle). After 12-15 days, the tubes in spring water produced highly characteristic sex organs and akinetes. In its natural habitat this tubular alga produces extensive bright green mats which harbor epiphytes (Cocconeis placentula, Gomphonema longiceps), unicellular algae (Closterium, Scenedesmus, and Cymbella), ciliates, and amphipods. (Snyder-Bat-W72-12744

ABSENCE OF CHLORINATED DIBENZODIOX-INS AND DIBENZOFURANS FROM AQUATIC ANIMALS,

Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station. V. Zitko.

Bulletin of Environmental Contamination and Toxicology, Vol 7, No 2/3, p 105-110, February 1972. 2 tab, 15 ref.

animals, *Chlorinated hydrocarbon pesticides, Toxicity, Sharks, Fels College Toxicity, Sharks, Eels, Gulls, Bioassay, Polychlorinated biphenyls, Aroclors, Bird eggs, Food chains, DDD, DDE, DDT, Gas chromatog-

Identifiers: *Chlorodibenzodioxin, *Chlorodibenzofuran, Biological samples, Tissue, Metabolites, Carcharodon carcharias, Phalacrocorax auritus, Larus argentatus, Anguilla rostrata, Esox niger, Cormorants, Muscle, Liver, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1268, Phenoclor DP-6, Chemical interference, Detection limits, p p' DDE, p p' DDD, p p' DDT.

Samples of eel and chain pickerel muscle, muscle and liver of white shark, eggs of cormorants and herring gulls, and samples of herring oil and fishmeal were analyzed by gas chromatography for the presence of chlorinated dibenzodioxin and dibenzofuran residues. Interference by PCB's was tested by using Aroclors 1221, 1232, 1242, 1248, 1254, 1260, and 1268, and Phenoclor DP-6. The residues were not detectable at limits of 0.04, 0.02, 0.02, 0.01, and 0.01 micrograms/g on tissue wet weight basis, for 2,3,7,8-tetrachlorodibenzodioxin (TCDD), a mixture of di-, tri-, and tetrachlorodibenzofuran (CDF), two isomeric hex-(HCDD), achlorodibenzodioxins tachlorodibenzodioxin (OCDD), and octachlorodibenzofuran (OCDF), respectively, in the shark, eggs of double-crested cormorants and herring gulls, eel and chain pickerel, and in com-mercial herring oil and fishmeal. In some cases PCB's were completely removed and sometimes retention times relative to peaks of p,p'-DDE were obtained in the samples analyzed. The results indicate that there is no detectable contamination of food chains by chlorinated dibenzodioxins and dibenzofurans. (Holoman-Battelle) W72-12745

QUALITATIVE AND **OUANTITATIVE** STUDY OF PLASTOQUINONE A IN THERMOPHILIC BLUE-GREEN ALGAE, Montana Univ., Missoula. Dept. of Botany. R. P. Sheridan.

Journal of Phycology, Vol 8, No 1, p 47-50, March 1972. 2 fig, 2 tab, 30 ref.

Descriptors: *Cyanophyta, Separation techniques, Photosynthesis, Chemical analysis, *Solvent extractions, Ultraviolet radiation.
Identifiers: *Chlorophyll a, *Plastoquinones,

*Thermophilic algae, *Synechococcus livids, Ultraviolet absorption spectra, Thin layer chromatography, *Plectonema

Two thermophilic blue-green algae (Synechoccus lividus and Plectonema sp.) were examined for the presence of plastoquinones by extracting a mixture of logarithmic growth phase cells containing

250-ml portions of cells in distilled water, heptane, and n-propanol. After repeated extractions to in-sure separation of any possible quinones in the epiphases from the hypophase, the dried epiphase material in heptane was thin-layer chro-matographed on silica gel. The PQ types A, B, and C from the Synechococcus strain Y52 were also tested by ultraviolet absorption spectral analysis and showed characteristics identical photosynthetic quinones isolated from spinach chloroplasts and maple leaves. Plactonema sp. at the surface of its gelatinous mat contained less PQA/chlorophyll a than filaments collected 0.5 cm beneath the mat surface. There are seasonal changes in the PQA/chlorophyll a ratio. The ratio changes observed for Plectonema sp. under field conditions are assumed to be largely influenced by changes in pigment content in response to seasonal changes in light intensity. It is suggested from the data that either the thermal algae are as advanced phylogenetically as the mesophilic Cyanophyta, or that the photosynthetic quinones are essentially identical in all chlorophyll a-containing plants and therefore cannot be used in phylogenetic in-terpretation. The values of PQA per cell and chlorophyll a per cell are presented with the changes in the ratio of PQA to chlorophyll a for cells grown at different light intensities. (Mackan-W72-12748

RETENTION OF DISSOLVED COMPOUNDS BY MEMBRANE FILTERS AS AN ERROR IN THE C-14 METHOD OF PRIMARY PRODUCTION MEASUREMENT.

Toronto Univ. (Ontario). Div. of Life Sciences. C. Nalewajko, and D. R. S. Lean. Journal of Phycology, Vol 8, No 1, p 37-43, March 1972. 3 fig, 6 tab, 14 ref.

Descriptors: *Primary productivity, *Measurement, Separation techniques, Water analysis, Radioactivity techniques, Carbon radioisotopes, Tracers, Organic compounds, Chlorella, Cultures, Retention, Filtration, Radioactivity.

Identifiers: *Errors, *Chlorella pyrenoidosa, *Cryptomonas ovata, C-14, *Membrane filters, Membrane filtration.

A source of error in measuring primary production by the C-14 method was the retention of C-14labeled bicarbonate and glycollate, and other C-14-labeled substances from filtrates of algal cultures and lake water on membrane filters. Carbon-14labeled sodium bicarbonate was added to axenic cultures of Chlorella pyrenoidosa and Cryptomonas ovata. After incubation, different volumes were filtered using 25 mm, 0.45 micron Millipore membrane filters and dried in a dessica-tor. The radioactivity of the algae on the membrane filters was measured as well as the radioactivity of any organic C-14-labeled compounds in the filtrate. Data indicate that under certain conditions, the retention of radioactivity by MF type, 0.45 micron Millipore filters from filtrates of algal cultures and lake water may represent a significant addition to the radioactivity in particulate matter retained by the filters and that the C-14-labeled material retained was not proportional to the volume but showed a saturation effect with increasing volume filtered. When the radioactivity retained by a filter is divided by the volume filtered, decreasing values are obtained with increased volume filtered which results in a similar type curve when different volumes of lake water or cultures are filtered. Radioactivity values per milliliter were constant using Chlorella in Chu 10 medium. However, the curve could be obtained by increasing pH and bicarbonate concentrations in the medium and on resuspending the algae in Lake Ontario (winter) filtrate. The values of cpm/ml retained from filtrates were low in Cryptomonas cultures. (Mackan-Battelle) W72-12749

PRECIPITATION SCAVENGING (1970). For primary bibliographic entry see Field 05B. W72-12752

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IN-CLOUD SCAVENGING ANALYSIS FROM COSMOGENIC RADIONUCLIDE MEASURE-MENTS, Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-12757

STABLE ELEMENTS OF THE ATMOSPHERE AS TRACERS OF PRECIPITATION SCAVENG-ING,
Battelle-Pacific Northwest Labs., Richland,
Wash.
For primary bibliographic entry see Field 05B.
W72-12758

CONCENTRATION VARIATION OF SOME TRACE METALS IN PRECIPITATION FROM GREAT PLAINS THUNDERSTORMS, Chadron Atmospheric Research Inst., Nebr. For primary bibliographic entry see Field 05B. W72-12759

SCAVENGING BY SNOW AND ICE CRYSTALS, Illinois Inst. of Tech., Chicago. For primary bibliographic entry see Field 05B. W72-12760

EUROPEAN INTEREST IN ACIDIC PRECIPITATION: A REVIEW, Battelle Memorial Inst., Seattle, Wash. Research Center.
For primary bibliographic entry see Field 05B. W72-12773

MECHANISMS OF IODINE INJECTION FROM THE SEA SURFACE, Florida State Univ., Tallahassee. Dept. of Oceanography. For primary bibliographic entry see Field 05B. W72-12776

MODEL FOR VARIATIONS WITH PARTICLE SIZE OF HALOGEN-ION RATIOS IN MARINE AEROSOLS, Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography.

For primary bibliographic entry see Field 05B.

W72-12777

THE DETERMINATION OF TRACE METALS IN SALINE WATERS AND BIOLOGICAL TISSUES USING THE HEATED GRAPHITE ATOMIZER, Miami Univ., Fla. D. A. Segar.

American Institute of Aeronautics and Astronautics, Paper No. 71-1051, 1971. Presented a Joint Conference on Sensing of Environmental Pollutants, Palo Alto, California, November 8-10, 1971. 5p, 3 fig, 5 tab, 22 ref.

Descriptors: *Methodology, *Analytical techniques, *Spectrophotometry, Trace elements, Sca water, Water chemistry, Metals, Iron, Copper, Nickel, Cobalt, Zinc, Lead, Chromium, Manganese, Silver, Cadmium, Solvent extractions.

*Atomic absorption spec-

Identifiers: *Atomic absorption spectrophotometry, *Graphite atomizer, Vanadium, Transition elements, Tissue analysis, Ammonium pyrolidine dithiocarbamate, Methyl iso-butyl ketone, Marine biological tissues. A selective, volatilization technique utilizing the heated graphite atomizer atomic absorption technique was developed for the analysis of iron in seawater. A similar technique may be used to determine vanadium, copper, nickel, and cobalt in saline waters when their concentrations are higher than those normally encountered in unpolluted seawaters. A preliminary solvent extraction using ammonium pyrolidine dithiocarbamate and methyl iso-butyl ketone permits the determination of a number of elements including iron, copper, zinc, nickel, cobalt and lead in seawater. The heated graphite atomizer technique was applied to the determination of trace transition elements in marine plant and animal tissues. (Svensson-Washington)

TEMPERATURE ACCLIMATION IN THE NER-VOUS SYSTEM OF THE BROWN BULLHEAD (ICTALURUS NEBULOSUS), Massachusetts Univ., Amherst. Dept. of Zoology. For primary bibliographic entry see Field 05C. W72.1721

WATER RESOURCES DATA FOR NEW YORK, 1970: PART 2. WATER QUALITY RECORDS. Geological Survey, Albany, N.Y. For primary bibliographic entry see Field 07C. W72-12862

SELECTED WATER-QUALITY RECORDS FOR TEXAS SURFACE WATERS, 1970 WATER YEAR, Geological Survey Austin Tex

YEAR; Geological Survey, Austin, Tex. A. J. Dupuy, and J. A. Schulze. Texas Water Development Board Report 149, June 1972. 211 p, 1 fig, 4 tab, 9 ref.

Descriptors: *Water quality, *Surface waters, *Basic data collections, *Water analysis, *Texas, Chemical analysis, Sediments, Biochemical oxygen demand, Dissolved oxygen, Nutrients, Pesticides, Trace elements, Discharge measurement, Water temperature.

Basic data for the special periodic network in Texas for the 1970 water year include selected chemical and biochemical records of surface waters, records of minor elements in surface waters, records of pesticides in surface waters, and records of pesticides in bottom deposits in streams. Pesticides include insecticides and herbicides. Most of the sites are at stream-gaging stations; at other sites, the water discharge was usually measured when the samples were collected so that the water quality could be considered in relation to the discharge. (Woodard-USGS)

MULTIELEMENT NEUTRON ACTIVATION ANALYSIS OF BIOLOGICAL MATERIAL USING CHEMICAL GROUP SEPARATIONS AND HIGH RESOLUTION GAMMA SPECTROMETRY, Cornell Univ. Ithaca, N.Y. Dept. of Chemistry.

Cornell Univ. Ithaca, N.Y. Dept. of Chemistry. G. H. Morrison, and N. M. Potter. Analytical Chemistry, Vol. 44, No. 4, p 839-842, April 1972. 1 fig, 3 tab, 12 ref.

Descriptors: *Neutron activation analysis, *Radiochemical analysis, Iron, Aluminum, Chlorine, Magnesium, Manganese, Strontium, Bromine, Sodium, Cobalt, Molybdenum, Copper, Gold, Cadmium, Zinc, Potassium, Chromium, Cesium, Calcium, Separation techniques, Radioisotopes, Radioactivity techniques, Arsenic radioisotopes, Cadmium radioisotopes, Chlorine radioisotopes, Cobalt radioisotopes, Gold radioisotopes, Potassium radioisotopes, Zinc radioisotopes, Strontium radioisotopes, *Trace elements, Halogens, Alkali metals, Alkaline earth metals, Heavy metals, Itradiation.

Identifiers: *Biological samples, *Gamma spectrometry, Orchard leaves, Kidney, Heart, Tissue, Vanadium, Arsenic, Antimony, Selenium, Samarium, Europium, Indium, Barium, Technetium, Gallium, Tungsten, Lanthanum, Scandium, Cerium, Rubidium, Counting.

Quantitative and qualitative information were obtained on 31 elements by chomical group separation and gamma spectrometric analysis of freeze dried samples of kidney, heart, and NBS Standard Reference Material 1571, orchard leaves. One gram samples were destructively irradiated for 8 hrs prior to chemical separation. Four sets on non-destructive irradiations were carried out on samples for various periods of time, permitting analysis of eight elements not determined in the chemically processed groups (Al, Cl, Mg, Mn, V, Sr, As, Sb, Se). After irradiation the samples were digested in a sulfuric acid-nitric acid mixture and Br-82 was determined in the volatile phase by gamma counting. The residue phase was dissolved in HCl, passed through a hydrated antimony pentoxide mesh column extraction system, and Na-24 was determined as above. Effluent from the extraction was passed through a column of Dowex 1-X8 and the collected solution saved for further analysis. The resin was eluted with HCl and the eluate and resin counted separately. The eluate yielded Fe-59, Co-60, Mo-99, Ga-72, Tc-99m, Cu-64 and W-187 while the resin yielded Au-198, Cd-115, In-115m, Zn-69m, Zn-65 and As-76. The previously collected solution was evaporated, the residue dissolved in HCl and passed through a column of Bio-Rad Ag 50W-X12. The resin group yielded counts for Sc-47, La-140, Ce-141, Ba-131, Sm-153, Eu-152m, the eluate group contained K-42, Cr-51, Rb-86, Cs-134, and Sc-46. Tabu'tted abundances correlate well with the NBS certified values. (Mackan-Battelle) W72-12924

ATOMIC ABSORPTION AND FLUORESCENCE SPECTROPHOTOMETRY WITH A CARBON FILAMENT ATOM RESERVOIR PART IX. THE DIRECT DETERMINATION OF SILVER AND COPPER IN LUBRICATING OILS, Intercial Coll of Science and Technology. London

Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.

L. F. Alder, and T. S. West. Analytica Chimica Acta, Vol 58, No 2, p 331-337, February 1972. 4 fig, 5 tab, 5 ref.

Descriptors: *Copper, *Oil, *Heavy metals, Lubricants, Calcium, Chromium, Iron, Lead, Zinc, Phosphorus, Sulfur, Pollutant identification, Chemical analysis, Absorption, Aqueous solutions, Organic compounds, Fluorescence, Trace elements.

Identifiers: *Atomic absorption spectrophotometry, *Fluorescence spectrophotometry, *Silver, Barium, Detection limits, Sensitivity, Carbon filament, Atom reservoir, Chemical interference.

A method for the direct determination of silver and copper in clean and used lubricating oils utilizes atomic absorption and fluorescence spectrophotometry with a carbon filament atom reservoir. The oil sample is pipetted onto the carbon filament and the volatile fractions are evaporated off at various low temperature levels. The metal is then atomozed by increasing the filament temperature to 2500-2700 C and the free, transitory atoms produced above the surface of the filament temperature by an atomic absorption technique utilizing a slightly modified conventional atomic absorption spectrophotometer in conjunction with hollow-cathode lamps as line sources. Due to the considerable amount of noise on the atomic absorption signal, detection limits were poor but the sensitivities were good; absolute sensitivities of 0.13 and 0.22 picograms were obtained for copper and silver. A ready determination of silver and copper in both clean and used lubricating oils can be obtained through the use of this method. The

Group 5A-Identification of Pollutants

only serious interferences from elements normally present in lubricating oils are calcium on copper and barium on silver. The fact that the nominal 2400 ppm calcium content in the engine oils did not noticeably affect the copper determinations com-pared to the spectrographic analyses indicated that the form in which the calcium was present could be of significance or that the spectrographic method is equally affected by the presence of cal-cium. (Byrd-Battelle)

SIMULTANEOUS MICRODETERMINATION OF NITRATES AND NITRITES BY DIFFERENTIAL GASOMETRIC REACTION, Ain Shams Univ., Cairo (Egypt). Dept. of Chemis-

S. S. M. Hassan. Analytica Chimica Acta, Vol 58, No 2, p 480-483, February 1972. 2 tab, 11 ref.

Descriptors: *Nitrates, *Nitrites, *Chemical analysis, Ureas, Nitrogen, Chemical reactions, Reduction (Chemical), Nitrogen compounds, *Aqueous

solutions, Water analysis.
Identifiers: Precision, Sulphamic acid, Nitrous oxide. Recovery.

A method for the simultaneous microdetermination of nitrites and nitrates in various binary mixtures utilizes an apparatus consisting of a reaction vessel connected to a Dewa flask containing solid carbon dioxide and to a micronitrometer containing fresh 50 percent KOH solution. Samples containing nitrite and nitrate (3-8 mg of each) are weighed into the reaction vessel and purged with carbon dioxide (100 bubbles/min). A saturated aqueous solution of sulphamic acid or urea is added and the liberated nitrogen gas collected until the reaction is completed. The percent nitrite present is based on the assumption that one mole of nitrogen is equivalent to one mole of nitrite. Once the nitrogen gas is removed, the system is purged with CO2 for 2 min and HCl is added. The reaction vessel is heated to boiling until the reaction is completed. The volume of nitrous oxide gas collected indicates the amount of nitrate present; one mole of nitrous oxide is equivalent to one mole of nitrate. Various mixtures of different nitrate samples with potassium nitrite were analyzed with sulphamic acid and urea. With sulphamic acid, the average recovery was 99.2 and 99.1 percent, respectively, for nitrates and nitrites; and 99.6 and 99.9 percent, respectively, using urea. Reduction sulphamic acid is recommended since the reaction proceeds more smoothly and rapidly than with urea. (Snyder-Battelle)

INTERFERENCE OF FATS IN THE DETER-MINATION OF MERCURY RESIDUES IN FISH BY ATOMIC ABSORPTION SPECTROMETRY, Department of Agriculture, Saskatoon (Saskatchewan), Research Station. J. G. Saha, and Y. W. Lee. Bulletin of Environmental Contamination and

Toxicology, Vol 7, No 5, p 301-304, May 1972. 2

Descriptors: *Lipids, *Mercury, *Fish, Heavy metals, Chemical analysis, Methodology, Organic compounds, Organic matter, Solvent extractions,

Identifiers: *Chemical interference, *Atomic absorption spectrometry, Biological samples, Tissue, Lard, Corn oil, Cod liver oil.

Two atomic absorption spectrometric methods for determining mercury residues in fish are compared and an assessment made of the effect of the presence of fat on mercury determinations by these methods. About 5 or 10 mg of fat (lard, corn oil or cod liver oil) were added to the reagent blanks in both methods and the apparent mercury content determined. Mercury content of the reagent blanks (without the addition of fat or fish tissue) in both the methods was determined and the results corrected accordingly. The method of Wobeser et al. gave consistently higher values than that of Saha et al. for the mercury content of the fish examined. With the former method, the addition of fat to the reagent blank gave an ap-parent 'mercury' peak in the AA spectrometer whereas the Saha et al. method gave no 'apparent mercury' because the fats are removed with chloroform before extraction of mercuric ions with dithizone. These results indicate that in the wet oxidation methods of determining mercury in fish tissue any fat remaining in the digests can interfere in the estimation of mercury by atomic absorption spectrometry and give high values. This interference can, however, be easily removed by extraction of the digests with chloroform prior to the recovery of mercuric ions with dithizone. (Holoman-Battelle)

DDT-DEHYDROCHLORINASE FOR IDENTIFI-

CATION OF DDT IN SOIL, Alberta Univ., Edmonton. Dept. of Entomology. R. H. Gooding, and H. G. Philip.
Bulletin of Environmental Contamination and

Toxicology, Vol 7, No 5, p 288-291, May 1972. 3

Descriptors: *Soil analysis, *DDT, *DDE, *Chemical reactions, Chemical analysis, Enzymes, Pollutant identification, Soils, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Metabolism, Gas chromatography, Solvent extrations, Separation techniques, Aroclors. Identifiers: *DDT-dehydrochlorinase, Chemical interference, Sample preparation, Aroclor 1221, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, Aroclor 1262, Metabolites.

DDT-dehydrochlorinase extracted from DDT-resistant houseflies was used to confirm the identification of DDT by enzymatically converting DDT to DDE. Samples containing 0.001-10.0 micro-grams of DDT were evaporated to dryness after which the residue was dissolved in dimethyl sulfoxide, combined with a DDT-dehydrochlorinase solution, gased with nitrogen, incubated, and extracted into an organic layer with saturated sodium sulfate followed by 2:1 cyclohexane: 2-propanol mixture. The organic layer was injected into a gas chromatograph equipped with a Pyrex column and a tritium foil detector. In the application of this method to soil analysis, samples were extracted in acetone-acetonitrile followed by a clean-up through petroleum ether and an activated florisil column. All the samples analyzed contained significant amounts of material identified as DDT but not metabolizable by DDT-dehydrochlorinase. Aliquots of the above samples were checked to determine if there were materials extracted from the soil which interfered with the complete metabolism of the DDT present. No enzymatic inhibitions by contaminants in the extracts were detected. Most of the contaminants were PCB's. Further testing with several PCB's (Aroclors) revealed that they do not interfere with the enzymatic confirmation of DDT. (Holoman-Battelle) W72-12934

THE MICRODETERMINATION OF CALCIUM BY THE USE OF AMBERLITE IRC-50 RESIN AND GLYOXAL BIS (2-HYDROXYANIL), Medical Research Council, Oxford (England).

Analyst, Vol 97, No 1152, p 233-237, March 1972. 1 tab, 6 ref.

Descriptors: *Calcium, *Colorimetry, Phosphates, Silicates, Aqueous solutions, Resins, Ions, Ion exchange, Water analysis, Methodology, Color reactions, Indicators, Inhibitors, Chemical reactions, Carbonates.

Identifiers: *Glyoxal bis (2-hydroxyanil), *Amberlite IRC-50 resin, *Microanalysis, Distilled water, Chemical interference, Absorbance, Citric acid, Sample preparation.

Conditions have been described for the use of Amberlite IRC-50 resin and glyoxal bis (2-hydrox-yanil), GBHA, in the microdetermination of calcium in solutions containing phosphate. Determinations of calcium in deionized distilled water are made colorimetrically by placing a neutral or slightly acidic solution containing less than 5 micrograms of calcium into a colorimeter tube and adding water for a total volume of 1.4 ml. Two ml of methanol and 0.2 ml of GBHA solution are added plus 0.33 ml of 0.10 N sodium hydroxide solution. The solution will develop a clean red color which should be read within 3 minutes. Readings are recorded against a blank of 1.4 ml of water, and under the conditions described, 1 microgram of calcium will read between 10 and 12 on the colorimeter scale. For acidic solutions, additional sodium hydroxide is needed, and a procedure for its addition is described. The effects of various ions on this reaction are described and procedures given for the use of Amberlite IRC-50 resin with GBHA as an indicator in determining trace amounts of calcium in the presence of phosphate. Simple procedures for the determination of phosphate and silicate are also given. (Mor-tland-Battelle) W72-12937

THE USE OF A MIXED-SOLVENT SYSTEM FOR THE DETERMINATION OF CALCIUM AND ZINC IN PETROLEUM PRODUCTS BY ATOMIC-ABSORPTION SPECTROSCOPY, Shell Research Ltd., Chester (England). Thornton

Research Centre. S. T. Holding, and P. H. D. Matthews.

Analyst, Vol 97, No 1152, p 189-194, March 1972. 2 tab. 1 ref

Descriptors: *Calcium, *Zinc, Oil, Spectroscopy, Oil industry, Metals, Inorganic compounds, Solvent extractions, Separation techniques. Identifiers: *Oil characterization, *Atomic absorp-

tion spectroscopy, Transmission fluids, Hydrochloric acid, Organic solvents, Sample preparation, Precision, Absorbance, Petroleum

A mixed-solvent system that permits the use of inorganic compounds as standards has been applied to the determination of calcium and zinc in unused lubricating oils and automatic transmission fluids by atomic-absorption spectroscopy. By the incorporation of hydrochloric acid into the solvent system, it has been possible to eliminate the systematic errors that may occur when an air acetylene flame is used in the determination of calcium. A sample containing about 0.5 mg calcium is weighed into a 50 ml beaker to which is added ten ml of mixed solvent (cyclohexanone, alcohol, industrial methylated spirit-50:30:20) and 5 ml concentrated hydrochloric acid. The mixture is shaken, heated to 40 C and transferred to a 100-ml calibrated flask by use of about 60 ml of mixed solvent and 5 ml water. For zinc, oil containing about 0.1 mg zinc is weighed directly into a 100 ml calibrated flask and 60 ml of the mixed solvent and 5 ml of hydrochloric acid are added. After shaking, 5 ml of water are added. In both cases, after further shaking the mixed solvent is added to bring the solution up to the calibration makr. A fuel-lean air - acetylene flame is used for the determination to give good precision. Results have been obtained for a wide range of unused lubricating oils and automatic transmission fluids and there is good agreement with those obtained by X-ray fluorescence and established Institute of Petroleum, chemical procedures (I.P. 111/49T Method B and I.P. 117/66T Method B). (Mortland-Battelle) INTERDISCIPLINARY MONITORING OF THE

NEW YORK BIGHT, Grumman Aerospace Corp., Bethpage, N.Y.

Grumman Aerospace Corp., Bedapage, N.T. Research Dept.
W. G. Egan, J. M. Cassin, and M. E. Hair.
Available from the National Technical Information Service as AD-737 506, \$3.00 in paper copy, \$0.95 in microfiche. Grumman Research Department Memorandum No RM-534J, January 1972. 15 p. 5 fig. 7 ref.

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Descriptors: *Instrumentation, *Monitoring, *Water properties, *On-site data collections, New York, Bioluminescence, Biological properties, Chlorophyll, Turbidity, Sampling, Mathematical models, Estuarine environment, Salinity, Chemical States of the Properties of acl analysis, Biomass, Dissolved oxygen, Ther-mocline, Hydrogen ion concentration, Flow, Chemical properties, Physical properties, Hudson River, Depth, Water temperature, Nutrients, Al-gae, Nitrogen, Phosphorus, Dinoflagellates, Laboratory tests, Water quality control, On-site investigations, Physiochemical properties, Water

Identifiers: *New York Bight, Collaborative stu-

Interdisciplinary physical, chemical, and biological measurements were made in the New York Bight during 1969-70 using new in situ electronic Bight during 1969-70 using new in situ electronic instrumentation, with associated monitoring by conventional procedures to check the performance. This new equipment was partly an original design and partly modified commercial instrumentation and included photometric sensors and a modified Beckman conductivity cell, photovolt flow type electrode sensor, and Delta Scientific oxygen probe. This equipment was found to be feasible for the measurement of chlorophyll (and the related biomass), bioluminescence, Gelbstoff, pH, dissolved O2, salinity, and the location of the thermocling. It annears that mmescence, Geistott, pH, dissolved O2, salinity, and the location of the thermocline. It appears that the in situ instrumentation may be adapted to continuous synoptic monitoring of the estuarine and oceanographic parameters necessary for mathematical modeling. (Snyder-Battelle) W72-12941

SPECTROPHOTOMETRIC DETERMINATION OF ARSENITE, ARSENATE, AND PHOSPHATE IN NATURAL WATERS, Rhode Island Univ., Kingston. Graduate School of

Oceanography.
D. L. Johnson, and M. E. Q. Pilson.
Analytica Chimica Acta, Vol 58, No 2, p 289-299,
February 1972. 5 fig, 3 tab, 19 ref.

Descriptors: *Spectrophotometry, *Phosphates, Chemical reactions, Arsenic compounds, Chemical analysis, Metals, Molybdenum, Oxidation, Methodology, Reduction (Chemical), Color reactions, Water pollution sources, Water analysis,

Pollutant identification.
Identifiers: *Arsenate, *Arsenite, Arsenic, Precision, Dection limits, Absorbance.

A relatively simple method, based on the work of Johnson (1971), has been developed for the routine analysis of arsenite, arsenate, and phosphate by spectrophotometric measurement of the arsenic and phosphate molybdenum blue complexes. A reducing agent is used to lower the oxidation state of the arsenic present in the samples chosen to a plus 3, eliminating any absorbance caused by molybdoarsenate since arsenite will not form the molybdoarsenate since arsenite will not form the molybdenum complex. This, in effect, results in measurement of an absorbance value for phosphate alone. A mixed (color) reagent added to 'untreated' samples produces color from both molybdophosphate and molybdoarsenate, and the difference between the 2 absorbances is therefore proportional to the arsenate concentration. An oxidizing agent, iodate, is added to samples chosen for oxidation to convert arsenite to arsenate. The experimental conditions are such that the absorbance difference between an 'oxidized' and a

'reduced' sample is the absorbance arising from total inorganic arsenic. The arsenite concentration is then calculated as the difference between total-As and arsenate-As. The method has been shown to be applicable to fresh and salt water samples where the total concentration of arsenic is less than about 3 micromoles. Recovery experiments for various quantities of phosphate, arsenate, and arsenite added to Sargasso Sea water were accurate within plus or minus 0.017 and 0.012 for arsenate or arsenite and phosphate, respectively. (Mackan-Battelle) W72-12942

SIMULTANEOUS ASSAY OF CALCIUM-45 AND STRONTIUM-89 IN DOUBLE-ISOTOPE BIOLOGICAL SAMPLES BY LIQUID SCINTIL-

BIOLOGICAL SAMPLES BY LIQUID SCINTIL-LATION COUNTING, Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils. J. E. Hardcastle, W. H. Fuller, and R. J. Hannapel. Analytical Biochemistry, Vol 46, No 2, p 534-547, April 1972. 3 fig, 6 tab, 8 ref.

Descriptors: *Radiochemical analysis, Calcium, Strontium radioisotopes, Bioassay, Soil analysis, Cations, Anions, Spectrometers, Aqueous solutions, Vegetation, Barley, Ammonium salts, Salts, Iron, Potassium, Sodium, Radioactivity

techniques.
Identifiers: *Ca-45, *Sr-89, *Biological samples, *Liquid scintillation spectrometry, Barium, Chemical interference, Precision, Sample preparation, Wet ashing.

The method for simultaneously counting Ca-45 and Sr-89 in samples from radiotracer experiments and Sr-89 in samples from radiotracer experiments involves (1) drying aqueous samples containing the radionuclides (and salt carrier), (2) dissolving the salt residues in the alkyl phosphate/toluene/fluor (scintillation) solution, and (3) analyzing the double-isotope samples in a liquid scintillation spectrometer. Prior to assay, biological samples must be digested and converted to chloride salts. A standard nitric acid-hydrogen peroxide wet ashing technique is used to digest plant samples and concentrated HCl added to convert the residues to centrated HCl added to convert the residues to chloride salt. Soil samples are treated with sodium acetate to extract Ca-45 and Sr-89 and wet-ashed as above to remove organic material and convert the radioisotopes to chloride salt. Based on expected and experimentally determined standard deviations, a precision better than one percent is possible for samples with rates of 10,000 cpm; low possible for samples with rates of 10,000 cpm, now counting rates reduce precision to 3-4 percent. Maximum counting efficiencies of 87 and 65 per-cent were obtained for standards of Ca-45 and Sr-89, respectively. The digestion technique using barley straw showed recoveries of over 90 percent and about 5 percent precision for both isotopes. Large amounts of the insoluble ferric, Ba, K, Na, and ammonium salts and other cations were found to cause serious counting problems. (Holoman-W72-12943

THE DETERMINATION OF MERCURY BY ATOMIC-ABSORPTION SPECTROPHOTOMETRY WITH THE 'DELVES SAMPLING CUP' TECHNIQUE, Imperial Coll. of Science and Technology, London (Excharge).

(England). Dept. of Chemistry.
D. Clark, R. M. Dagnall, and T. S. West.
Analytica Chimica Acta, Vol 58, No 2, p 339-346,
February 1972. 3 fig. 1 tab, 18 ref.

Descriptors: *Mercury, *Spectrophotometry, Chemical analysis, Ions, Calibrations, Aqueous

Identifiers: *Delves cup method, *Atomic absorption spectrophotometry, Chemical interference, Detection limits, Flame atomization, Absorbance.

An extension of the Delves cup method was used in the determination of mercury by atomic absorp-

tion spectrophotometry. A microsampling ap-paratus involving a nickel absorption tube and nickel foil crucible (Delves Sample Cup) was con-structed and the whole assembly designed so that the crucible could be precisely moved in and out of the flame, with the nickel crucible fitted directly the flame, with the nickel crucible fitted directly below the aperature in the underside of the absorption tube when in the atomization position. Absorbance measurements were made at 253.65 nm on standard Hg solutions prepared by diluting a stock solution (1 mg Hg/ml) of Hg (II)ckloride dissolved in 1M HCl. Calibration curves were constructed by plotting peak height versus mercury concentration. A double absorption peak was obtained and a detection limit of 0.17 ng Hg was achieved using a 5-microliter sample and a triplerow capillary hydrogen diffusion flame. The optimal flame type and absorption tube temperature were considered in relation to the sensitivity and degree of interference from extraneous ions. The interferences observed in the described method of atomization was not deemed to be common to the conventional techniques. (Mackan-Battelle)

MICROTURBELLARIANS FROM FRANCONIA:
A CONTRIBUTION TO THE KNOWLEDGE OF
SYSTEMATICS AND ECOLOGY OF TURBELLARIA EXCL. TRICLADIDA IN SOUTHERN
GERMANY, (DIE KLEINTURBELLARIEN
FRANKENS EIN BEITRAG ZUR SYSTEMATIK
UND OKLOGIE DER TURBELLARIA EXCL.
TRICLADIDA IN SUDDEUTSCHLAND),
Erlangen-Nuremberg Univ. (West Germany).
Zoologisches Institut.
J. Bauchhenss.

Internationale Revue der Gesamten Hydrobiologie, Vol 56, No 4, p 609-666, 1971. 21 fig, 1 tab, 121 ref.

Descriptors: *Systematics, *Ecology, Aquatic animals, Invertebrates, Seasonal, Phenology, Dis-

animals, Invertebrates, Seasonal, Phenology, Distribution patterns.
Identifiers: "Turbellaria, Flatworms, Periodicity, Taxocenes, Oligochoerus limnophilus, Catenula lemnae, Catenula macrura, Suomina turgida, Stenostomum spp., Rhyachoscolex simplex, Microstomum spp., Prorhyachus stagnalis, Geocentrophora sphyrocephala, Plagiostomum lemani, Bothrioplana semperi, Microdalyellia spp., Gieysztoria spp., Castrella truncata, Microdalyellia rossi, Castrella vernalis, Typholplana viridata, Typholplana halleziana, Styloplanella strongylostomoides, Castrada spp., Strongylostoma radiatum, Dochmiotrema lim-Styriopyaneua strongylostomolos, Castrada spp., Strongylostoma radiatum, Dochmiotrema lim-nicola, Rhynchomesostoma rostratum, Olishtanel-la truncula, Olisthanella obtusa, Krumbachia styriaca, Mesostoma spp., Bothromesostoma per-sonatum, Phaenocora spp., Opistomum pallidum, Gyratrix hermaphroditus, Opisthocystis goettei.

Sixty-one microturbellarian species exclusive of the Order Tricladida were collected from freshwater habitats of Franconia (Southern Germany) and their taxonomy, ecological needs, and seasonal occurrence studied. Species found for the first time in Germany were: Catenula macrura, Stenostomum grabbskogense, Stenostomum arevaloi franconia, Macrostomum obtusum, Macrostomum orthostylum, Microdalyellia microphthalma, Microdalyellia brevispina, Castrella vernalis, Styloplanella strongylostomoides, Castrada perspicua, Krumbachia styriaca. Stenostomum arevaloi franconia n. ssp. was separated from Stenostomum arevaloi. Its refractile bodies are all of the same diameter. This subseparated from Stehostonian advants. Its Fractile bodies are all of the same diameter. This subspecies is exclusively found in Franconia. Phenological groups were established according to the seasonal occurrence of species in Franconia.
The curve of seasonal distribution of the species shows two peaks during the year (June, August) snows two peaks during the year (une, August) and the great number of eurychrone species is very conspicuous. According to the biotic and abotic features, the microturbellarian taxocenes described were associated with 12 definite types of habitats. These taxocenes are characterized by

Group 5A-Identification of Pollutants

characteristic species, a special combination of species, or by the absence of certain species. (Holoman-Battelle) W72-12945

ANALYSIS OF TOXIC METALS IN TRADE EF-FLUENTS BY ATOMIC ABSORPTION SPEC-TROPHOTOMETRY,

P. J. Belling. Effluent and Water Treatment Journal, Vol 9, No 6, June 1969, p 314-318, 332, 5 tab.

Descriptors: *Analytical techniques, *Spectrophotometry, *Metals, *Industrial wastes, Chromium, Copper, Manganese, Iron, Sodium, Sulfates, Phosphates, Zinc, Pollutant identifica-

Identifiers: *Atomic absorption spectrophotometry, *Electroplating industry, Interference effects, Nickel, Interference suppression agent, Strontium chloride, Hydrochloric acid, Toxic metals.

Atomic absorption spectrophotometry has been utilized in the determination of the more important toxic metals, i.e., chromium, copper, nickel, zinc, and manganese found in effluents from the electroplating industry. The interference effects produced by iron, sodium, phosphate and sulfate on the determination of chromium, copper, manganese, nickel and zinc were investigated. The mutual interaction of chromium and nickel was also The absorption of chromium was depressed by iron and nickel, and the absorption of nickel was enhanced by iron, chromium, and sodium. Interference with the determination of copper, manganese and zinc was insignificant at iron/metal ratios of up to 200:1. The only interference effect noticed for phosphate and sulfate was the depressed absorption of nickel by phosphate. The use of 1% W/V of strontium chloride and 5% V/V of hydrochloric acid as an interference suppression agent resulted in satisfac-tory recovery of the added toxic metal at levels likely to be found in trade effluents. (Galwardi-Texas) W72-12963

THE VALUE OF THE SEED GERMINATION TEST FOR EVALUATING THE TOXIC ACTION OF POLLUTED WATER. Leipzig Univ. (East Germany). Hygiene-Institut. G. Vogler.

Z Gesamte Hyg Grenzgeb. Vol 17, No 8: p 582-

Identifiers: *Pollutant identification, Chlorination, *Germination, Seeds, Sinapis alba D, Testing,

In the seed germination test, seeds of Sinapis alba are placed on filter paper in sterilized Petri dishes in part contact with water to be tested for suitability for agricultural irrigation. After 2 or 3 days in the dark, the hypocotyl or root length is measured in comparison with root length of control seed in unchlorinated drinking water. Reduced root growth is evidence of pollution and perhaps cause for rejection of the water. This test was studied and found wanting on 2 counts: seed germinating conditions are physiologically different from those in ordinary growing photosynthesizing plants, and Sinapis alba seeds are not a suitable test object.— Copyright 1972, Biological Abstracts, Inc.

5B. Sources of Pollution

LIQUID-WASTE DISPOSAL AT THE LINFIELD DISPOSAL SITE, DALLAS, TEXAS, Geological Survey, Austin, Tex. E. R. Leggat, J. F. Blakey, and B. Massey. Geological Survey Report, May 1972. 28 p, 4 fig, 3 Descriptors: *Water pollution sources, *Liquid Descriptors: "Waste disposal, "Texas, Seepage, Infil-tration, Groundwater, Streams, Water analysis, Chemical analysis, Water chemistry. Identifiers: "Dallas, "Unlined pits.

The disposal of liquid wastes in unlined pits at the Linfield disposal site in south Dallas, Texas, has resulted in percolation of the waste materials the underlying groundwater reservoir. In effect, the pits are point sources of recharge and pollution, not only to the groundwater body, but to the Trinity River, which is the ultimate point of natural discharge of the groundwater. Continued use of the pits can result only in further degradation of the quality of the groundwater. Water level measurements were used to construct a water-table map which shows a radial outflow from the recharge mound developed in the immediate vicinity of the pits. Upon reaching the water table, which is no more than 2 or 3 feet below the bottom of the pits, the effluent mixes with the groundwater and moves down the hydraulic gradient, eventually to be discharged to the river. The heterogeneous groundwater quality observed in the test wells results from the different types and volumes of liquids being placed in the pits and from the random cycle followed in filling the pits. Although values for most water-quality parameters varied greatly both in time and place, the waters from all test wells were highly mineralized. (Woodard-USGS) W72-12414

HEAVY METAL CONTENT OF SOME RIVERS AND LAKES IN WALES, Liverpool Univ. (England). Dept. of Oceanog-

M. I. Abdullah, and L. G. Royle Nature, Vol 238, No 5363, p 329-330, August 11,

Descriptors: *Heavy metals, *Trace elements, *Water pollution sources, Manganese, Copper, Lead, Iron, Cadmium, Nickel, Zinc, Path of pollutants, Water quality, Data collections. Identifiers: *Wales.

Welsh rivers and lakes are remarkably free from domestic and industrial pollutants, but because of the presence of mineral deposits and the remains of mining activities, they are likely to have small but significant concentrations of heavy metals that may cause severe deterioration of the water quality. For example, the presence of lead, zinc and copper in some Welsh streams causes a high mortality rate in fish and other living populations of these streams, and the heavy metals carried to the sea by Welsh rivers are the primary source of these metals in Cardigan Bay. But since the cessation of mining activities in the early part of this century, some rivers have shown some recovery from the effects of lead pollution. Different metals occur at high concentrations in the various rivers. The River Ystwyth, reported in 1936 to be lead and zinc polluted, and more recently to be recovering, contains moderately high zinc and lead ranging between 200-270 micrograms Zn/liter and 2-6 micrograms Pb/liter. Manganese and cadmium are moderate (7-15 and 1.1-1.3 micrograms/liter respectively), The River Rheidol is found to be rich in manganese (9-28 micrograms/I) and zinc, cadmium and lead levels are moderately high. The largest total amount of metals is found in the River Twymyn, where the zinc, copper, lead, cadmium, manganese and nickel levels are high. The River Mawddach shows a high copper content whereas its zinc content is only just above the value for average clean water. The unusually high average manganese concentrations found at the head of the Mawddach, Dwyryd and Dysynii estuaries are possibly caused by the occasional interaction between saline water and the suspended hydrated manganese oxide carried down by the stream. (K-napp-USGS) W72-12425 OIL SLICKS AND FILMS.

Defense Documentation Center, Alexandria, Va.

Available from NTIS, Springfield, Va. 22151 as AD-738 500, Price \$3.00 paper copy; 95 cents microfiche. Defense Documentation Center Bibliographic Report DDC-TAS-71-64, March 1972. 74 p. (DDC Bibliography for the period September 1961-March 1971).

Descriptors: *Bibliographies, *Oil spills, *Water pollution sources, *Oil pollution, *Documentation, Oceans, Seashores, Beaches, Estuaries, Ecology, Cleaning, Methodology, Environmental effects. Information retrieval.

This unclassified bibliography on oil pollution was compiled from the entire Defense Documentation Center's data bank (January 1953 - November 1971). References pertain to the cleaning and removal of oil slicks, oil films, and related films from water surfaces. Included are Corporate Author-Monitoring Agency, Subject, Title, and Personal Author Indexes. (Woodard-USGS) W72-12426

ADVANCED NONTHERMALLY POLLUTING GAS TURBINES IN UTILITY APPLICATIONS. United Aircraft Research Labs., East Hartford,

Copy available from GPO Sup Doc EPA 16130 DNE 03/71, \$2.00; microfiche from NTIS as PB-211 283, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, March 1971. 264 p, 82 fig, 31 tab, 142 ref. EPA Program 16130 DNE 03/71.

Descriptors: *Thermal powerplants, *Thermal pollution, Economics, Comparative costs, Steam turbines, *Water cooling, *Electric power, *Utili-Identifiers: *Gas turbines.

Performance, size and cost for advanced simple-, regenerative-, and compound-cycle gas turbine en-gines were reviewed. For various regions of the U.S., comparisons were made of installed costs and total busbar power costs of a 1000-MW power station using gas turbines versus one using steam turbines. It is shown that the gas turbines in the 1970 decade could produce electric power at lower costs than steam turbines in the South Central U.S. where natural gas is readily available. Elsewhere in the U.S. the gas turbines would be economically competitive if moderately priced clean fuels were available. Advanced gas turbines are expected to become more competitive in the 1980's as anticipated increases in turbine inlet temperature, component efficiencies and larger engine designs lead to more efficient and lower cost engines. Although the development costs for large, advanced gas turbines would approach 100 to 200 million dollars, the total amount that utilities are expected to expend for cooling devices to combat thermal pollution over the next two decades is more than ten times this amount. (Eagle-Van-derbilt) W72-12450

HEATED SURFACE JET DISCHARGED INTO A

PLOWING AMBIENT STREAM,
National Center for Research and Training in the
Hydrologic and Hydraulic Aspects of Water Pollution Control, Nashville, Tenn. L. H. Motz, and B. A. Benedict.

Copy available from GPO Sup Doc EPA 16130 FDQ 03/71, \$1.75; microfiche from NTIS as PB-211 284, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, March 1971. 207 p, 75 fig, 16 tab, 48 ref. EPA Program 16130 FDQ 03/71.

Descriptors: *Cooling water, *Thermal pollution, *Jets, *Turbulent flow, *Thermal powerplants, Heated water, Thermal stratification, Diffusion,

Water temperature, Heat exchange, Temperature, Density stratification, On-site investigations. Identifiers: *Heat discharge, Buoyant jets, Ambient fluids. Temperature profiles.

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The temperature distribution in the water body due to a discharge of waste heat from a thermal-electrical plant is a function of the hydrodynamic electrical plant is a function of the hydrodynamic variables of the discharge and the receiving water body. The temperature distribution can be described in terms of a surface jet discharging at some initial angle to the ambient flow and being deflected downstream by the momentum of the ambient velocity. It is assumed that in the vicinity of the surface jet, heat loss to the atmosphere is realigible. It is concluded that the ambiration of of the surface jet, heat loss to the atmosphere is negligible. It is concluded that the application of the two dimensional surface jet model is dependent on the velocity ratio and the initial angle of discharge, and the value of the initial Richardson number, as low as 0.22. Both laboratory and field data are used for verification of the model which has been developed. Laboratory data is used to evaluate the two needed coefficients, a drag coefficient and an entrainment coefficient, as well as the length of the zone of flow establishment and the length of the zone of flow establishment and the angle at the end of that zone. (Eagle-Van-derbilt) W72-12451

SURFACE DISCHARGE OF HEATED WATER, Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab. H. Stefan, N. Hayakawa, and F. R. Schiebe. Copy available from GPO Sup Doc EPA 16130 FSU 12/71, \$2.00; microfiche from NTIS as PB-211 285, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 256 p, 86 fig, 4 tab, 66 ref. EPA Program 16130 FSU 12/71.

Descriptors: *Outlets, *Thermal pollution, *Mathematical models, Jets, Flow, Mixing, Lakes, Entrainment, *Model studies, *Heated water, *Discharge (Water). Identifiers: Thermal plume data, *Surface discharge. discharge.

A comprehensive analytical model has been developed to describe the flow of heated water from a channel onto the surface of a lake or reservoir. This analytical tool can be used to predict depth, width, temperature, and flow velocity in a heated water surface jet. Weak cross-currents and winds are included. The model also predicts the total amount of heat actually lost to the atmosphere and the amount of ambient water entrained. As presented, the analytical method is simple and inexpensive to apply. It assumes fully established buoyant jet flow into a homogeneous environment. It can be extended to include, for example, an outlet zone (zone of flow establishment) or stratification in the ambient water. Criteria for the existence of the two-dimensional mixing interto statistation in the ambient water. There is to the existence of the two-dimensional mixing internal hydraulic jump and the rates of entrainment which it may produce have been established theoretically and verified with a limited number of experimental data. The results of two field surveys experimental data. In telestation of two fleat surveys in a thermal plume are presented. Comparisons with laboratory data illustrate the outstanding significance of the densimetric Froude number and the relative insignificance of the Reynolds number as modeling parameters. (Eagle-Vanderbilt) W72-12452

A TEST SIMULATION OF THE TEMPERATURE OF THE ILLINOIS RIVER AND A PREDICTION OF THE EFFECTS OF DRESDEN II AND DRESDEN III REACTORS, Battelle Memorial Inst., Richland, Wash. Pacific Northwest Lab.

Northwest Lao.

R. T. Jaske.

Available from the National Technical Information Service as BNWL-728, \$3.00 in paper copy, \$0.95 in microfiche. AEC Research and Development Report No. BNWL-728, UC-2, April 1968. 35 p, 18 fig, 4 tab, 9 ref. AEC AT (45-1) - 1830.

Descriptors: *Temperature, *Forecasting, *Thermal pollution, Weather data, Froude number, Stratified flow, *Water temperature. Identifiers: *Colheat simulation system, *Illinois River, Advected heat, Flow records, Thermal

Two test simulations that involve application of the digital simulation system were performed. Actual data collected at two widely differing drainage basins were used. The results of the Illinois River simulation and the prediction of the effects of the thermal loading to be imposed by the operation of Dresden 2 and 3 reactors are summarized. It is concluded that the Colheat simulation system is generally adequate to represent the water temperature of the Illinois River within the accuracy of the available data record. The study forecasts significant alteration of the present thermal regime of the Illinois River 39 miles down stream at Ottawa. On a yearly average basis, about 70 percent of the heat of the present Dresden plant is dissipated to the atmosphere before reaching that point. This is expected to decrease to about 60 percent for the combination of Dresden 1 and 2, and to about 50 percent for the three plants. The field data support the validity of Debler's use of the densimetric Froude number as an index of the stratifying tendency of rivers and reservoirs. (Upadhyaya-Vanderbilt) dency of rivers and reservoirs. (Upadhyaya-Van-derbilt) W72-12454

A PROGRAM TO ASSESS THE THERMAL DISCHARGE FROM A PLANNED NUCLEAR POWER PLANT ON CAYUGA LAKE, Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

In: Proceedings 12th Conference on Great Lakes Research, University of Michigan, Ann Arbor, May 5-7, 1969, p 664-673. 7 fig, 2 tab, 4 ref.

Descriptors: *Currents (Water), *Remote sensing, *Water temperature, Nuclear powerplants, Mix-ing, Meteorological data, Instrumentation, Model studies, Infrared radiation, *New York. Identifiers: *Cayuga Lake (NY).

Cayuga Lake, one of the Finger Lakes in New York State, is the site of an operating fossil-fuel plant and the proposed site of a nuclear power installation. Cornell Aeronautical Laboratory has conducted a program to determine the physical changes that would occur in the lake when the changes that would occur in the lake when the proposed 830 megawatt nuclear power plant goes into operation. The approach taken is described and some samples of the experimental data obtained in the program are presented. Infrared aerial surveys have been taken over the site under a variety of meteorological, seasonal and lake conditions to collect lake surface temperature data for thermal plumes of interest. Four buoys have been placed in the site area. Temperature measurements recorded from a set of 48 thermistors spaced at various depths provide an accurate and nearly continuous picture of the thermocline at those four buoy locations. In addition, lake current and meteorological measurements are being made and used through an extensive modeling program in used through an extensive modeling program in predicting the thermal changes in the Lake which would result from construction of the nuclear power plant. (Upadhyaya-Vanderbilt) W72-12456

SIMULATED THERMAL EFFLUENT INTO LAKE ONTARIO,
Toronto Div. of Sanitary Engineering (Ontario).
Water Quality Surveys Branch.
M. D. Palmer.
In: Proceedings 12th Conference on Great Lakes
Research, University of Michigan, Ann Arbor,
May 5-7, 1969, p 674-685. 9 fig, 4 tab, 12 ref.

Descriptors: *Water temperature, *Mathematical models, Forecasting, Winds, Dye releases, Heated water, Dispersion, *Lake Ontario, Model studies, *Simulation analysis, *Thermal pollution.
Identifiers: *Thermal effluent, Variance, Plume.

The dispersion pattern of Duffin Creek water into Lake Ontario was determined under two different wind conditions in the spring time when the flow was 180 cfs and 5F warmer than the lake water. Continuous Rhodamine B dye injection was used to trace the plume. In both studies, the maximum concentration of dye remained very near to the shoreline. Based upon experimental results, a model was developed which predicts maximum concentration within 25 percent for distances up to 4000 ft from the source. The relationship between dye concentration and distance was found. The model applied to an existing thermal generating station at Lakeview was capable of predicting maximum temperatures within 25 percent of mea-sured values. (Upadhyaya-Vanderbilt) W72-12457

SATELLITE MEASUREMENT OF LAKE-SU-RFACE TEMPERATURES, Allied Research Associates, Inc., Concord, Mass.

For primary bibliographic entry see Field 02H. W72-12460

THE APPLICATION OF AN EMPIRICAL MODEL FOR THE DETERMINATION OF WATER TEMPERATURE IN A THERMALLY POLLUTED IMPOUNDED RIVER (ZASTOSOWANIE MODELU EMPIRYCZNEGO DO WYZNACZANIA TEMPERATURY RZEKI SPIETRZONEJ,OBCIAZONEJZRZUTAMI PODGRZANYCH WOD), State Inst. of Hydrology and Meteorology, Warsaw (Poland).

saw (Poland).

J. Jaworski. Przeglad Geofizyczny, No. 1-2, p 27-38, 1971. 6 fig, 9 ref.

Descriptors: "Heat balance, "Water temperature, "Forecasting, Hydraulies, "Thermal pollution, Heated water, Model studies. Identifiers: "Empirical models, "Vistula River.

Starting from a general heat balance equation, a method has been developed which enables the determination of temperature changes in a section of an impounded river that had been thermally polof an impounded river that had been thermally polluted. The model can predict the temperature in
any profile of the impounded river within an error
of 0.3C. Attempts to verify this model under the
conditions of a free-flowing river (Narew) under
different hydraulic and morphometric conditions
were satisfactory and the calculations showed a
considerable coincidence with measurements. The
empirical model is valid for conditions prevailing
in the Victula River near Nowa Huta Since the empirical model is valid for conditions prevailing in the Vistula River near Nowa Huta. Since the verification of the model was carried out under conditions differing essentially from the experimental conditions, one may expect that the suggested model may be used for other rivers featuring similar hydraulic and morphometric conditions. (Upadhyaya-Vanderbilt) W72-12463

TRANSACTIONS OF THE THERMAL EF-FLUENT INFORMATION MEETING. For primary bibliographic entry see Field 05D. W72-12466

THERMAL EFFLUENT-WHAT IT IS, WHERE IT COMES FROM AND WHERE IT GOES, Idaho State Univ., Pocatello. Dept. of Nuclear Science and Engineering.
A. E. Wilson.

In: Transactions of the Thermal Effluent Informa-tion Meeting - Boise, Idaho, July 9, 1970, Idaho Nuclear Energy Commission, Idaho Falls, Idaho, (1970), p 7-17.

Descriptors: *Thermal pollution, *Heat balance, *Energy loss, Energy conversion, Thermal power-plants, Evaporation, Heat transfer, Temperature, *Path of pollutants.

Group 5B-Sources of Pollution

The relationship between heat energy and temperature is explained. Thermal effluents are present in large numbers of energy conversions, but the ones of concern are those which produce a concentrated effluent source. At the present thermal electric generating capacity and assuming an average efficiency of 35%, there must be nearly 600 million kilowatts of waste heat somewhere in the country. The amount of waste heat continues to increase. Waste heat is dumped either directly or indirectly into the air, water, or the earth or it evaporates water. At the present rate of increase of energy use, in 100 years the mean surface temperature of the earth will have risen about 2.5 degrees F. It is not certain what the effect would to melt the polar ice caps. (See also W72-12466) (Eagle-Vanderbilt) be but a rise of 5 degrees is estimated to be e

RADIOLOGICAL STATUS OF THE GROUND-WATER BENEATH THE HANFORD PROJECT JULY-DECEMBER 1970.

Battelle Pacific Northwest Labs., Richland, Wash, T. H. Essig.

Available from the National Technical Informa-

tion Service as BNWL-1613, \$3.00 in paper copy, \$0.95 in microfiche. Report No BNWL-1613, September 1971, 20 p, 3 fig, 5 tab, 5 ref.

Descriptors: *Nuclear wastes, *Groundwater. *Radioisotopes, *Monitoring, Nitrates, Tritium, Tracers, Strontium radioisotopes, Potable water, Water pollution effects, Radioactive Wastes, Sediments, Ions, Water pollution sources, Evaluation, Radioactive waste disposal.

Identifiers: Rubidium radioisotopes, Uranium, Cesium radioisotopes, Rhodium.

The status of groundwater contamination resulting from disposal of Hanford plant effluents is evaluated. It is assumed that the radionuclides Ru-106 and tritium, and the nitrate ion move at essentially the same rate as groundwater. In addition, they can be detected in groundwater at low concentra-tions relative to their respective drinking water standards. Therefore, they are used to trace the groundwater flow pathes away from the major disposal sites. The Ru-106-Rh and tritium concentrations measured in the unconfined groundwater during the second half of 1970 show that the zones of detectable contamination extend in an easterly to southeasterly direction from 200-E Area (chemical processing areas) as observed in the past. For the first time, concentrations were measured over a geographically extensive area in the vicinity of the 100 Areas (production reactor areas). The few locations for which average groundwater concentrations exceeded the Concentration Guide for Ru-106 were all within either 200-E or 200-W Areas. Gross beta activity concentrations in the groundwater beneath the 100 Areas decreased such that the only samples showing detectable beta activity were from wells located at 100-N Area. Concentrations of uranium, the principal radionuclide observed in 300 Area (fuel fabrication and laboratory area) groundwater, averaged less than 0.5 pCi/ml. Water samples from several wells with piezometer tubes extending to deep aquifers were obtained and analyzed; all such sa ples had gross beta concentrations less than the analytical limit (0.2 pCi/ml). Nitrate ion concentrations greater than 10 percent of the Public Health Service recommended drinking water standard of 45 ppm were observed in most groundwater samples from wells within and surrounding the 200 and 300 Areas. However, groundwater from these zones is not consumed by humans or animals. (Mortland-Battelle) W72-12481

INTERVAL SCANNING PHOTOMICROG-RAPHY OF MICROBIAL CELL POPULA-TIONS,
Pennsylvania State Univ., University Park, Dept.

of Microbiology.

L. E. Casida, Jr. Applied Microbiology, Vol 23, No 1, p 190-192, January 1972. 1 fig. 4 ref.

Descriptors: *Population, *Monitoring, *Microorganisms, Surveys, Bacteria, Growth chambers, Fungi, Growth rates, Cultures. Identifiers: *Scanning photomicrography, Agromyces ramosus, Photomicrography.

A procedure is presented for photographically recording growth and other changes occurring within microbial populations over periods of time. The technique involves photographically scanning a prepared microculture chamber at intervals during incubation in a fixed focal plane. The microculture chamber is prepared by drilling a 1.9 m hole in a glass slide, filling the hole with agar and placing a Teflon sheet on one side and a culture smeared cover slip with a scribed 'x' overlying the agar-filled hole on the other side of the slide. Scanning photography was accomplished with a phase-con-trast microscope using the quadrants of the 'x' as reference areas. This technique has been used to study the growth, in the presence or absence of the stimulant catalase, of the catalase-negative fungus Agromyces ramosus. (Mackan-Battelle) W72-12483

MICROBIAL DEGRADATION OF DDT METABOLITES TO CARBON DIOXIDE, WATER, AND CHLORIDE,

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.

D. D. Focht.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 1, p 52-56, January 1972. 1 fig, 3 tab, 5 ref.

Descriptors: *Metabolism, *Microbial degrada-tion, *DDT, Growth rates, Cultures, Sewage ef-fluents, Chlorides, Pesticide kinetics, Soil fungi, Carbon dioxide, Water, Soil bacteria, Degradation (Decomposition).

Identifiers: *Hydrogenomonas, Culture media, Plate counts, DDM, p-chlorophenylacetic acid, Fusarium, Hydrogen chloride, Metabolites, Substrate utilization, Reaction products, Selective

A hyaline Moniliaceae fungus was shown to be capable of converting chlorinated bacterial degradation products of DDT metabolites to water, carbon dioxide, and hydrogen chloride. The fungal isolate was obtained from sewage effluent by selective culture with 3-chloro-cis-crotonic acid as the sole carbon source in a mineral salts medi um. Fungal and bacterial growth were determined turbidmetrically and by viable plate counts. Fungal growth was evident within 5 days and both fungal supernatant liquids were positive for chloride; uninoculated controls were negative. The fact that the fungus was able to grow on both ring fission products clearly established the breakdown of DDM, a DDT metabolite, to carbon dioxide, and chloride. It was shown that fungal growth in this system is totally dependent on degradation products excreted by the bacterium Although an exogenous energy source is needed, if the source is too great, bacterial growth 'swamps out' fungal growth. When conditions approaching optimum are met, the degradation of DDM can proceed (Mortland-Battelle) W72-12484

INITIAL STUDIES ON THE MICROBIAL BREAKDOWN OF TRIALLATE, Saskatchewan Univ., S, Regina, Dept. of Biology. D. R. Cullimore, and A. E. Smith. Bulletin of Environmental Contamination and

Toxicology, Vol 7, No 1, p 36-42, January 1972. 2

Descriptors: *Microbial degradation, *Thiocarba-mate pesticides, Absorption, Cultures, Separation techniques, Gas chromatography, Molds, Soil bacteria, *Soil microorganisms, Metabolism, Perteria, "Soil microorganisms, Metadolism, Persistence, "Pesticide kinetics, Path of pollutants, Soil fungi, Yeasts, Solvent extractions, Loam, Pseudomonas, Soil microbiology, Soil dynamics. "Triallate, "Substrate utilization, Bioaccumulation, Culture media, Electron capture s chromatography, Penicillium, Chladosporium, Rhodotorula, Pseudomonas fluorescens, Aerobacter cloacae, Aerobacter aerogenes, Serfluorescens. Actionature Chromobacterium viscosum, Proteus vul-garis, Propionibacterium jensenii, Pseudomonas aeruginosa, Aerogenes hydrophilia, Xanthomonas campestris, Eriwina amylovora, Achromobacteri-um parvulus, Disk method.

Two methods were utilized for studying the in-teraction of the herbicide Triallate (S-2,3,3-trichloroallyl N, N diisopropylthiolcarbamate) with microorganisms isolated from soil and stock solutions. The objective was to determine if microbial activity caused breakdown of the Triallate. The first method, the 'Disk' method, involved the preparation of basal agar plates seeded with the culture under test. The second method utilized a basal broth to which 3 ppm Triallate had been added. Some of the soil bacteria were more sensi-tive to inhibition by Triallate than others. Triallate is absorbed by strains of Penicillium during rapid mycelial growth and is retained while the mold remains viable. This results in poor extraction of Triallate by benzene but it is extractable by a mixture of benzene and isopropanol. The persistence of Triallate in soil may be in part due to its absorbance onto microbial cells. It appears probable that after application to the soil, some Triallate becomes adsorbed onto growing mold mycelia where it remains during the life of the mold. Upon death, the chemical is presumably released and either readsorbed, degraded, or lost by volatiliza-tion. (Mortland-Battelle) W72-12485

LIGHT-SCATTERING PROFILES IN THE

STRAITS OF FLORIDA, Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.; and Miami Univ., Coral Ga-bles, Fla. Optical Physics Lab. H. R. Gordon, and J. M. Smith.

Bulletin of Marine Science, Vol 22, No 1, p 1-9, March 1972. 4 fig, 1 tab, 8 ref.

Descriptors: *Equipment, Light penetration, *Measurement, Florida, Straits, Bottom-reflected light, Data collections, Sampling, Instrumentation, Physical properties, Optical properties, Particle size, Suspended load, Water currents, Stratifica-Bottom sediments, Depth, Depth-area curves, Organic matter.
Identifiers: *Light scattering, *Profiles, Particu-

late matter, Light-scattering meter.

A simple, in situ 45 degree angle, light-scattering meter, used to obtain scattering profiles in the Florida Current, is described. The instrument consists of a nearly collimated light source from a bulb which is powered by a rechargeable 6-volt alkaline battery. The scattered light is received by a photomultiplier tube which is energized by a low-voltage power supply and the scattering meter is attached to a seven-conductor supporting cable about 3 m above a commercial STD unit which utilizes two of the conductors. Relative calibration of the instrument is achieved by measuring the signal when the instrument is 10 meters below the surface, with the instrument is 10 meters below the surface, with a ground-glass plate 10 sq mm in area inserted in the beam and field of view of the photomultiplier. The depth is obtained by placing the signal from the STD's depth channel directly on the second channel of a two-channel recorder. The light scattering profiles obtained east of the current axis demonstrate the existence of high concentrations of particulate matter close to the bottom. Near the axis of the current, an anomalously high scattering coefficient was observed as well as a scattering maximum near the depth of largest vertical shear. Rapid fluctuations in scattering, observed at all depths on each station, are attributed to statistical fluctuations of the concentration of large particles in the scattering volume. (Snyder-Battelle) W72-12488

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DEGRADATION OF N-A SULFONATES BY PSEUDOMONAS, Koninklijke/Shell-Laboratorium, N-ALKANE-1-Amsterdam

G. J. E. Thysse, and T. H. Wanders. Antonie van Leeuwenhoek, Vol. 38, No 1, p 53-63, 1972. 4 fig, 4 tab, 15 ref.

Descriptors: "Microbial degradation, "Linear al-kylate sulfonates, "Sulfonates, "Pseudomonas, Soil bacteria, Aquatic bacteria, Pathogenic bac-teria, Biodegradation, Water pollution sources, Loam, Sea water, Pollutant identification, Deter-

gents, Degradation (Decomposition), Metabolism, Spectrometers, Chemical reactions. Identifiers: "Substrate utilization, "Alkane sul-fonate, Aliphatic hydrocarbons, Dissimilation, Electron capture gas chromatography, Scintilla-tion counting, Alkanes, Gas liquid chromatog-raphy, Liquid scintillation, Pseudomonas aeru-

A study was conducted to: (1) obtain conclusive evidence for the pathway of n-alkane sulfonate dissimilation in pseudomonads; (2) prove or dis-prove the presence of additional minor pathways and/or side reactions; and (3) obtain information on the enzyme which catalyzes the attack on the alkane sulfonate molecule. The microorganisms used were accumulated by the elective-culture method and two pure cultures, AJI and AJ2, iso-lated for further study. The capability of the microbe to utilize a compound was determined by microbe to utilize a compound was determined by inoculating mineral agars containing the compound and incubating for 76 hr at 30 C. Cultures containing C-14-labeled and unlabeled pentane sulfonate were analyzed by liquid scintillation counting and GLC, respectively, to determine if there were any accumulation of propionate and valerate; accumulation of corresponding fatty acids from the C8-C12 alkane sulfonates was also confirmed by electron capture GLC. AJI grew well on the low-molecular-weight alkane sulfonates, but not on higher ones; AJ2 accepted only the high-molecular-weight sulfonates. The sulfonate oxidizers AJ1 and AJ2 did not grow at the expense of a n-paraffin, and the paraffin oxidizer did not grow a n-paraffin, and the paraffin oxidizer did not grow on the sulfonate media. The alkane sulfonates were dissimilated by AJ1 and AJ2, ultimately to near caroon dioxide, water, and sulfate. In the primary oxidation reaction (s) the corresponding fatty acid and sulfate were formed. The fatty acid was subsequently degraded by beta-oxidation. (Byrd-Battelle) yield carbon dioxide, water, and sulfate. In the pri-W72-12490

CATIONIC UPTAKE AND EXCHANGE IN SAL-MONELLA ENTERITIDIS, Georgia Univ., Experiment. Div. of Food Science. J. R. Chipley, and H. M. Edwards, Jr. Canadian Journal of Microbiology, Vol. 18, No. 4, p 509-513, April 1972. 7 tab, 17 ref.

Descriptors: *Cation exchange, *Absorption, Zinc radioisotopes, Zinc, Manganese, Sodium, Iron, Calcium, Environmental effects, Radioactivity techniques, Ion transport, Salmonella, Enteric bacteria, Aerobic bacteria, Cytological studies, Path of pollutants, Stable isotopes, Membrane processes, Pathogenic bacteria. Identifiers: "Salmonella enteritidis, Manganese

radioisotopes, Calcium radioisotopes, Iron radioisotopes, Sodium radioisotopes, Sample preparation, Chemical interference.

The uptake and use of inorganic radioactive cations (Zn-65, Ca-47, Mn-54, Na-22 and Fe-59) in cells and cell walls of Salmonella enteritidis was investigated by suspending the cells in a flask of 500 ml sterilized, chemically defined growth media

and incubating them on a rotary shaker at 37 C for 4-6 hr. After this, the cation was added as its chloride salt and the cultures allowed to grow for 24-26 hr. The suspensions were centrifuged and the resulting pellets resuspended 3 times in distilled water. Aliquots of all washing solutions were measured for amounts of radioisotope lost in the procedures. Cell walls were prepared by sonifi-cation and chemical treatment and then treated as above. The loss of radioactivity was measured after all samples were resuspended in salt solu-tions by use of a spectrometric and liquid existintions by use of a spectrometric and liquid scintilla-tion system. The effects of pH, temperature, time and ionic interference (K vs Na-22 ion) were deter-mined by similar tests. Both the uptake and exchange of radioactive cations were energy-de-pendent and influenced by pH, dialysis time and pendent and intended by pr. danysis time and temperature, and by the ionic content of the sur-rounding medium. Cell walls bound Ca-47 to the greatest extent, followed in order by Zn-65, Mn-54, and Fe-59. Another determining factor for caionic exchange was valency, with divalent cations exchanging to the greatest extent, followed by trivalent and monovalent cations, respectively. The greatest amount of exchange occurred between a radioisotope and a stable isotope of the same species. All losses of radioactivity were diasame species. All iosses of radioactivity were dis-lyzable indicating that this exchange involves very small moieties, perhaps the cation alone. Both 2,4-dinitrophenol (DNP) and N,N'-dicyclohexylcar-bodiimide (DCCD) significantly decreased au-tologous exchange, cationic exchange, and ca-tionic uptake in either cell or cell walls. (Mackan-Bottello) Battelle)

BACTERIAL CELL PRODUCTION FROM HEX-ADECANE AT HIGH TEMPERATURES, Wisconsin Univ., Madison. Dept. of Biochemistry.

D. A. Sukatsch, and M. J. Johnson. Applied Microbiology, Vol 23, No 3, p 543-546, March 1972. 3 tab, 12 ref.

Descriptors: *Bacteria, *Cultures, *Growth rates, *Temperature, Organic compounds, Fermentation, Analytical techniques, Nitrogen, Absorption, Centrifugation, Carbon, Hydrogen, Ammonia, Incentringation, Caroni, riyutogen, Amonin, in-cubation, Cytological studies, Resistance. Identifiers: *Hexadecane, Culture media, Oc-tadecane, Aliphatic hydrocarbons, Enrichment, Ammonium ions, Substrate utilization.

An investigation was conducted to determine whether bacterial cell yields could be obtained above 45 C that were equal to those obtainable at lower temperatures. A medium containing hexadecane was used for fermentation and a similar medium for enrichment. A mineral agar plating was made by adding 1.8 percent Ionagar No. 2 to the fermentation medium. Soil was used to inoculate 100 ml of enrichment medium in 500 ml Erlenmeyer flasks. Growth was assessed by observation of pressure decreases in the flask. A 3-liter feror pressure decreases in the mass. A state termining cell yield (grams of dry cells/g hex-adecane). The growth rate was calculated from the rate of nitrogen uptake, which was determined by a Nesslerization procedure for direct determina-tion of ammonium ion in centrifuged samples. Stable enrichment cultures were readily obtained at 25, 35, 45, 55, and 65 C. In all cases the cultures 23, 33, 45, 55, and 65 C. In all cases the cultures consisted of more than one organism. Both lower cell yields and slower growth rates were observed at higher temperatures. The highest yield obtained at 65 C was 0.26 and the lowest yield at 25 or 35 C W72-12496

BACTERIOPHAGES OF CLOSTRIDIUM BOTU-

British Columbia Univ., Vancouver. Dept. of Microbiology.
C. E. Dolman, and E. Chang.
Canadian Journal of Microbiology, Vol 18, No 1, p
67-76, January 1972. 32 fig, 1 tab, 20 ref.

Descriptors: *Bacteriophage, *Clostridium, *Electron microscopy, Cultures, Toxicity, Nutrients, Centrifugation, Systematics, Pathogenic bacteria. Identifiers: Lysogeny, Culture media, *Clostridium botulinum, Sample preparation.

um botulnum, sample preparation.

Electron microscopy was used in a study to determine the extent and variety of the phage flora associated with Clostridium botulinum. Over one-half of the strains studied were isolated in the investigating laboratory between 1944 and 1969; the others were obtained from a wide variety of sources throughout the world. Practically every strain produced toxin whose type was verified by specific botulinus anti-toxin-neutralization tests in mice. The GPBI-ground meat medium was used for routine maintenance of cultures. Single colonies were selected from cultures plated out on brain heart agar or blood agar medium to ensure purity. Cultures were transferred to a TYG medium (3 percent tryptone, 2 percent yeast extract, 1 percent glucose, and 0.1 percent sodium hioglycollate) for electron microscope preparation. A 5 percent solution of glutaraldehyde in 0.2 m phosphate buffer at pH 6.2 was added and cultures were subjected to a two-stage centrifugation. m phosphate buffer at pH 6.2 was added and cultures were subjected to a two-stage centrifugation. One microgram of Mitomycin-C per milliliter was added to 4 hr growth in the TYG medium followed by further inoculation at 37 C for about another 4 hr to induce cultures. It was concluded that characteristic phage particles are to be found, generally in small numbers, in the majority of young toxic cultures, regardless of their type. (Mortland-Battelle)

CAPACITY OF DESERT ALGAL CRUSTS TO FIX ATMOSPHERIC NITROGEN,

Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.

A. N. Macgregor, and D. E. Johnson.
Soil Science Society of America Proceedings, Vol
35, No 5, p 843-844, September-October 1971. 7

Descriptors: *Algae, *Nitrogen fixation, *Nitrogen fixing bacteria, *Rainfall, *Arid lands, *Arizona, Grasslands, On-site data collections,

In addition to their role in increasing nitrogen, algal crusts, which contain a variety of microorganisms, are reported to enhance soil water infilalgal crusts, which contain a variety of microorganisms, are reported to enhance soil water inflitration and to provide a layer of organic matter suitable for seed germination. A study was undertaken to determine how soon algal crusts from a semiarid soil are able to fix N after being moistened and the rate of N fixation per unit area of moistened crusts. The study was conducted in a grassland area in the Tucson Basin of southern Arizona where approximately 4% of the soil surface possessed algal crust formations. Three hours after being moistened, algal crusts produced detectable levels of N fixation as measured by the acetylene-ethylene method. It was estimated that I ha of desert grassland receives a N input of 3-4 g/hr following a rainfall. This is fortunate in view of the burst of herbaceous plant growth and subsequent plant N requirements during the rainy season in the Sonoran Desert. (Casey-Arizona) W72-12505

DEPLETION OF OXYGEN BY MICROORGAN-ISMS IN ALASKAN RIVERS AT LOW TEM-

PERATURES,
Federal Water Pollution Control Administration,
College, Alaska. Water Lab.
For primary bibliographic entry see Field 05C.
W72-12553

PREDICTION OF DISSOLVED OXYGEN LEVELS IN THE SOUTH SASKATCHEWAN RIVER IN WINTER. New Brunswick Univ., Fredericton. Dept. of Civil

Engineering. For primary bibliographic entry see Field 05C.

Group 5B-Sources of Pollution

W72-12554

POLLUTION - A BIOLOGICAL STUDY OF SOME RECEIVING WATERS IN HOKKAIDO, Nara Women's Univ. (Japan). Zoological Inst. For primary bibliographic entry see Field 05C

RESULTS OF THE ELEMENTAL PHOSPHOROUS MONITORING PROGRAM, LONG HARBOUR, NFLD. (JULY 1970-APRIL

Bedford Inst., Dartmouth (Nova Scotia), Marine

Ecology Lab. R. F. Addison, M. E. Zinck, R. G. Ackman, P. Chamut, and A. Jamieson.

Fisheries Research Board of Canada, Technical Report No. 303, 1972. 25 p, 4 fig, 3 tab, 8 ref.

Descriptors: *Phosphorous, *Water pollution sources, *On-site data collections, Water pollution, Chemical wastes, Industrial wastes, Water analysis, Water sampling, Chemical analysis, Chromatography, Sediments, Cores, Herrings. Identifiers: Mackerel, *Long Harbour (Nfld).

Surface and bottom harbor water samples were examined for elemental phosphorous along with samples taken from settling ponds and associated points around the Electric Reduction Company of Canada (ERCO). Core samples from the harbor and samples of mackerel and herring caught in the harbor and suspected of being poisoned by ele mental phosphorous were also examined. The period covered was free of major emergencies due to phosphorous pollution. It seems that pollution control measures implemented by ERCO have had some success, but are not entirely satisfactory. (Svensson-Washington) W72-12571

ELEMENTAL PHOSPHOROUS LEVELS IN WATER SAMPLES FROM LONG HARBOUR, NFLD. (JULY, 1969-JUNE, 1970), Fisheries Research Board of Canada, Halifax

(Nova Scotia). R. F. Addison, R. G. Ackman, L. S. Cowley, D.

Mascaluk, and S. Pond.
Fisheries Research Board of Canada, Technical
Report No. 254, 1971. 29 p, 3 fig, 3 tab, 10 ref. ap-

Descriptors: *Phosphorous, *Water pollution, *Industrial wastes, 8on-site data collections, Water pollution sources, Chemical analysis, Chromatog-

Identifiers: *Long Harbour (Nfld).

During the period studied, elemental phosphorous (P sub el) levels in Long Harbour water rarely exceeded about 0.003 mg/l in areas where large amounts of P sub el are known to have been deposited in a previous accidental spill. In periods of bad weather, or when ship movements could have disturbed these deposits, traces or easily measurable levels of P sub el were observed in water up to 3 miles from the plant. Dredging opera-tions did not appear to redistribute significant amounts of stable P sub el into harbor waters, either as a result of mechanical disturbance of sediments, or by recirculating supernatant from treatment processes back into the harbor. At present no P sub el is being liberated into the harbor from the source of the previous spill. The only known source of P sub el is the deposits on the bottom. This P sub el is probably being released slowly into solution (or colloidal form), as is indicated by the relatively low levels (ppb range) consistently encountered. (Svensson-Washington) W72-12572

ACCUMULATION OF YELLOW PHOSPHOROUS BY SEVERAL MARINE IN-VERTEBRATES AND SEAWEED. Memorial Univ. of Newfoundland, St. John's.

For primary bibliographic entry see Field 05C. W72-12574

IMPROVED METHOD OF TREATING PONDS WITH ANTIMYCIN A TO REDUCE SUNFISH POPULATIONS, Southeastern Fish Control Lab. Warm Springs,

For primary bibliographic entry see Field 05C.

CHARACTERIZATION OF NATURALLY OCCURRING DISSOLVED OR-GANOPHOSPHORUS COMPOUNDS, Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W72-12637

CONCENTRATION OF BROMIDE IONS IN SEAWATER BY ISOTOPIC EXCHANGE. Naval Ordnance Lab., White Oak, Md.

Available from the National Technical Informa-tion Service as AD-734 383, \$3.00 in paper copy, \$0.95 in microfiche. Report No. NOLTR 71-216, 8 November 1971, 15 p. 2 fig, 3 tab, 12 ref.

*Seawater, *Radioactivity techniques, *Bromides, Bromine, Separation techniques, Ions, Flow rates, Ion exchange, Gamma rays, Methodology, Water analysis, Pollu-tant identification.

Identifiers: *Isotope exchange, Counting, Desorption, Silver bromide, Br-82, radioisotopes, Gamma ray counter. Bromine

A method for the in situ determination of radioac-A method for the in situ determination of radioactive bromide ions in seawater involves passing samples containing Br-82 through an isotopic exchange column of AgBr bound into a crystal lattice. The amount of Br-82 exchanged is determined by gamma counting aliquots of the samples before and after running them through the column. A 3x3 factorial experiment was devised to study the effect of forcer on the proposite of Br-82 the effect of factors on the amount of Br-82 exchanged. The factors studied were: (1) height of the AgBr column, (2) flow rate, and (3) residence time. Each of these factors was found to have a significant effect on the amount of bromide exchanged. The desorption rate of Br-82 from the column was also studied. The results indicate that bromide ions in sea water can be concentrated by the isotopic exchange technique, that retention factors of 20-30 percent can be achieved by reduction of detector size, provided suitable flow-rates can be achieved, and that the desorption time is not excessive. (Mackan-Battelle)

AMINO ACID TRANSPORT IN NITZSCHIA OVALIS ARNOTT,

California Univ., Irvine. Dept. of Developmental and Cell Biology. For primary bibliographic entry see Field 05C. W72-12643

STREAM INSECTICIDE MONITORING STU-DIES, BERRIEN COUNTY, MICHIGAN OCTOBER 1968 THRU JULY 1970,

Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management. R. B. Willson, C. M. Fetterolf, Jr., J. L. Hesse, and

J. W. Bedford. Report, February 1971. 36 p, 4 fig, 11 tab, 2 ref.

Descriptors: *Dieldrin, *Monitoring, *Streams, Aquatic animals, Water pollution, Caddisflies, Dragonflies, Path of pollutants, Pollutant identification, Water analysis, Runoff, Pesticide kinetics, Flow, Aquatic insects, Movement, Sediments, Persistence, Mussels, Benthic fauna, Aquatic life, Mollusks, Clams, Freshwater fish, Snails, SunfIdentifiers: *Chlordane, Japanese beetles, Macroinvertebrates, Chubs, Dace, Burbot, Glossiphonia stagnalis, Amnicola, Ferrisia, Gyraulus, Helisoma, Physa, Stagnicola, Pisidium, Sphaeri-um, Gammarus, Cambarus robustus, Orconectes, Caenis, Calopteryx, Belostoma fluminea, Gerris, Limnogonus, Microvelia, Notonecta, Ranatra, Cheumatopsyche, Anacaena limbata, Cop-totomus, Cymbiodyta minima, Cymbiodyta vin-

A program to monitor insecticide application and assess its effects on the environment was begun following a decision in 1968 to apply dieldrin and chlordane to areas in Michigan in order to control a Japanese beetle infestation. Assessments were made of resident fish populations, and water, sediment, and tissues from caged mussels were moni-tored for chlordane and dieldrin before and after applications at two control and four test-stream stations. Gas chromatography of sample eluates provided pesticide identification and quantitations. Stream gauging equipment measured flow rates and run-off rates, and qualitative collections of benthic fauna were made twice after insecticide applications. Before treatment, chlordane mean concentrations were less than 0.2 ppb, 50 ppb, and 34 ppb in water, sediments, and mussel tissues, respectively; those of dieldrin were less than 0.02 ppb, 5 ppb, and 7.83 ppb for water, sediments, and mussels. Following treatment chlordane concentrations reached individual station highs of 3.4, 22,000 and 7,530 ppb, and dieldrin concentrations were 2, 2,000, and 1,137 ppb for water, sediments, and mussel tissues, respectively. Most of the movement of chlordane from land to streams occurred in the first 3 months while dieldrin continuously contributed but at a lower initial level. Test stream fish levels dropped in numbers and changed in species composition for as long as a year after applications. (Mackan-Battelle) W72-12650

CARBAMATES INSECTICIDES IN THE AQUATIC ENVIRONMENT I: HYDROLYSIS OF SEVIN, BAYGON, PYROLAN AND DIMETILAN IN WATERS,

National Research Center, Cairo (Egypt). Water Pollution Dept.

O. M. Aly, and M. A. ElDib.
Water Research, Vol 5, No 1, p 1191-1205,
December 1971. 5 fig, 4 tab, 9 ref.

Descriptors: *Hydrolysis, *Pesticide kinetics, *Persistence, *Aquatic environment, *Carbamate reresistence, "Aquatic environment, "Carobamae pesticides, Chemical degradation, Chemical reactions, Rates, Pesticide residues, Hydrogen ion concentration, Stability, Colorimetry, Environmental effects, Water temperature, Water pollution, Color reactions, Aqueous solutions, Water pollution sources, Water temperature, Ultraviolet

pollution sources, water temperature, children, radiation, Water quality control, Degradation.
Identifiers: *Sevin, *Baygon, *Pyrolan, *Dimetilan, Ultraviolet spectrophotometry, Hydroxyl ion concentration, Detection limits, Absorbance, l-naphthyl-N-methylcarbamate, O-isopropoxyphenyl-N-methyl carbamate, l-phenyl-3-methyl-5-pyrazolyl-dimethyl carbamate, 2-dimethyl carbomyl-5-pyrazolyl-dimethylcarbamate, United Arab Republic.

The rate of hydrolysis of the monoalkyl carbamate pesticides Sevin and Baygon, and the dialkyl car-bamates Pyrolan and Dimetilan in the aquatic environment were studied while investigating the physical, chemical, and biological factors that may influence the persistence of carbamate pesticides The rate of hydrolysis was determined with different hydroxyl ion concentrations, at different pH values (4.0-10.0), and at different tempera-tures. A colorimetric and an ultraviolet spectrophotometric method were used for the quantita-tive determination of the carbamate esters and their hydrolytic products. The hydrolysis of the 4 carbamate insecticides investigated in alkaline medium was found to be a function of the hydrox-

yl ion in the solution and was first order with respect to these ions. The second order rate constants, k sub 2, for the mono N-methyl substituted esters, Sevin and Baygon, were much higher than those for the N,N-dimethyl substituted ones. Second order rate constants for Sevin, Baygon, Pyrolan and Dimetilan at 20 C were found to be 204, 3.04, 0.70, and 0.0034 l/mol/min, respectively, ating that the dialkyl carbamates were mor stable to alkaline hydrolysis than the monoalkyl carbamates. All the compounds were stable to hydrolysis within the acidic pH range. However, measurable hydrolysis was observed at pH 7.0 and 8.0 for Sevin and Baygon, respectively, and the rates of hydrolysis increased with the rise of the rates of hydrolysis increased with the rise of the pH value. At pH 8.0 about 99 per cent of Sevin was hydrolyzed in 9 days while Baygon reached the same level of hydrolysis. After 107 days, Pyrolan and Dimetilan, on the other hand, were stable towards hydrolysis within the investigated pH range. Temperature increases resulted in an increase of the reaction velocity. The rate of hydrolysis increased 2-3 times for each 10 degree C rise over a range of 3-40 C. The persistence of the carbamate pesticides in natural waters is greatly influenced by the pH value and temperature of the fluenced by the pH value and temperature of the aquatic environment. (Mackan-Battelle) W72-12651

COMPATIBILITY OF SUBSURFACE RESERVOIRS WITH INJECTED LIQUID WASTES, Alabama Univ., University. Natural Resources Center

D. M. Grubbs, C. D. Haynes, T. H. Hughes, and S.

Available from the National Technical Information Service as PB-211 326, \$3.00 in paper copy, \$0.95 in microfiche. Report 721, June 1972. 89 p, 25 fig, 7 tab, 13 ref, 3 append. OWRR B-030-ALA (1).

Descriptors: *Injection wells, *Waste disposal wells, *Industrial wastes, *Underground storage, Permeability, *Porosity, Temperature, Pressure, Underground waste disposal. Identifiers: *Chemical compatibility, *Reservoir temperature, *Reservoir pressure.

Conclusions on effects of injection of incompati-ble liquids on permeability and porosity include: permeability decreased substantially after periods of injection, porosity decreased nominally after inof injection, effects of permeability diminuition pose greater problems than reduction in porosity, permeability appears to decline to a minimum value and stabilizes, normal subsurface pressures have little effect on magnitude of permeability nave attue effect on magnitude of permeability reduction, reservoir temperatures may accelerate chemical reactivity, suspended solids sharply reduce permeability, chemical reactions and their ultimate effects on porosity and permeability can be predicted from chemical analyses of waste, in-terstitial water and rock, laboratory studies can provide reliable data for design and operation of disposal systems, and engineering considerations disposal systems, and engineering considerations of pressure buildup will insure that normal pres-sure gradient of subsurface reservoirs will not be exceeded. The feasibility of subsurface disposal of liquid wastes is established, but this ultimate method of discarding toxic or undesirable wastes should be undertaken only after competent studies of geological, geochemical, and engineering parameters have been performed in each instance. (Warman-Alabama) W72-12656

SUBSURFACE WATER POLLUTION: A SELECTIVE ANNOTATED BIBLIOGRAPHY, PART I. SUBSURFACE WASTE INJECTION. Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information

Available from NTIS, Springfield, Va 22151, as PB-211 340 Price: \$3.00 paper copy; 95 cents microfiche. Report WRSIC 72-220E, March 1972,

Descriptors: *Bibliographies, *Water pollution, *Groundwater, *Waste disposal wells, Injection wells, Underground waste disposal, Malenclaves, Water torage, Water pollution sources, Water pollution effects, Legal aspects, Landfills, Leaching, Path of pollutants. Identifiers: *Groundwater pollution, *Subsurface

water pollution

Subsurface Water Pollution is a selective bibliography produced by the Environmental Protection Agency from the computerized data base of the Water Resources Scientific Information Center, U. S. Department of the Interior. This bibliography represents published research and development in water resources as abstracted and indexed in the semimonthly journal, Selected Water Resources Abstracts (SWRA). This bibliography represents a search of a 33,980-item data base, covering SWRA from October 1968 through December 1971, and is published in three parts. Part I covers pollution associated with subsurface waste injection. The bibliography contains references to technology dealing with the prevention or abatement of pollution, litigation pertaining to incidences of pollution, and laws and regulations pertaining to the construction and operation of subsurface waste disposal facilities. The index is made up of a fraction of the descriptors and identifiers by which each paper in this bibliog-raphy has been indexed, and represents weighted terms that best describe the information content. (See also W72-1286 and W72-12687) (Knapp-USGS) W72-12685

SUBSURFACE WATER POLLUTION: A SELECTIVE ANNOTATED BIBLIOGRAPHY, PART II.

SALINE WATER INTRUSION.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information

Available from NTIS, Springfield, Va 22151, as PB-211 341 Price: \$3.00; 95 cents microfiche. Report WRSIC 72-221E, March 1972, 161 p, 104 ref.

Descriptors: *Bibliographies, *Water pollution, *Groundwater, *Saline water intrusion, Malenclaves, Water pollution sources, Water pollution effects, Legal aspects, Landfills, Leaching, Path of pollutants.

Identifiers: *Groundwater pollution, *Subsurface

water pollution.

Subsurface Water Pollution is a selective bibliography produced by the Environmental Protection Agency from the computerized data base of the Water Resources Scientific Information Center, U. S. Department of the Interior. This bibliography represents published research and development in water resources as abstracted and indexed in the semimonthly journal, Selected Water Resources Abstracts (SWRA). This bibliography represents a search of a 33,980-item data base, covering SWRA from October 1968 through December 1971, and is published in three parts. Part II covers pollution associated with saline water intrusion. The bibliography contains references to technology dealing with the prevention or abatement of pollution, litigation pertaining to incidences of pollution, and laws and regula-tions pertaining to the construction and operation of subsurface waste disposal facilities. The index is made up of a fraction of the descriptors and identifiers by which each paper in this bibliography has been indexed, and represents weighted terms that best describe the information content. (See also W72-12685 and W72-12687) (Knapp-W72-12686

SUBSURFACE WATER POLLUTION: A SELEC-TIVE ANNOTATED BIBLIOGRAPHY, PART

III. PERCOLATION FROM SURFACE SOURCES. III. Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information

Available from NTIS, Springfield, Va 22151, as PB-211 342 Price: \$3.00 paper copy; 95 cents microfiche. Report WRSIC 72-222E, March 1972, 162 p. 107 ref

Descriptors: "Bibliographies, "Water pollution, "Groundwater, "Percolating water, "Waste disposal wells, Injection wells, Underground waste disposal, Malenclaves, Waste storage, Water pollution sources, Water pollution effects, Legal aspects, Landfills, Leaching, Path of pollutions

Identifiers: *Groundwater pollution, *Subsurface

Subsurface Water Pollution is a selective bibliography produced by the Environmental Protection Agency from the computerized data base of the Water Resources Scientific Information Center, U. S. Department of the Interior. This bibliography represents published research and development in water resources as abstracted and indexed in the semimonthly journal, Selected Water Resources Abstracts (SWRA). This bibliography represents a search of a 33,980-item data base, covering SWRA from October 1968 through December 1971, and is published in three parts. Part III covers pollution associated with percolation from surface sources. The bibliography contains references to technology dealing with the prevention or abatement of pollution, litigation pertaining to incidences of pollution, and laws and regulations pertaining to the construction and operation of subsurface waste disposal facilities. operation of sinsurface waste unsposs attenues. The index is made up of a fraction of the descriptors and identifiers by which each paper in this bibliography has been indexed, and represents weighted terms that best describe the information content. (See also W72-12685 and W72-12686) (Knapp-USGS) W72-12687

GEOCHEMISTRY OF HOLOCENE BEDS OF LAKE MUTNOYE (GEOKHIMIYA GOLOT-SENOVYKH OTLOZHENIY OZ. MUTNOGO), Akademiya Nauk SSSR, Moscow, Institut Geokhimii i Analiticheskoi Khimii. For primary bibliographic entry see Field 02H. W72-12688

NITROGE, PHOSPHORUS, AND POTASSIUM CONTENT IN ATMOSPHERIC PRECIPITATION IN BELORUSSIA (POSTUPLENIYE AZOTA, FOSFORA I KALIYA S ATMOSFERNYMI OSADKAMI V BELORUSSII), Belorusskii Nauchno-Issledovatelskii Institut Pochvovedeniya i Agrokhimii, Minsk (USSR). For primary bibliographic entry see Field 02B. W72-12696

PHOSPHATES - A CHALLENGE TO ENVIRON-MENTAL SCIENCES, Toronto Univ. (Ontario). P. H. Jones. Water and Pollution Control, Vol 110, No 4, p 19-

24, April 1972. 13 ref.

Descriptors: *Phosphates, *Detergents, *Water pollution sources, *Social aspects, Surfactants, Social impact, Industrial production, Legislation, Water pollution control, Water quality control, Nitrilotriacetic acid, Eutrophication, Water pollution effects, Water quality act, Canada, Phosphorus, Water pollution.

The issue of phosphates in the environment is shown to have reached public attention by the same stages or steps as any other pollution issue:

Group 5B-Sources of Pollution

(1) presence of the problem, yet unrecognized as a problem; (2) recognition; (3) action; (4) reaction; and (5) legislation and regulation. The problem of phosphates is discussed in relation to the production and use of detergents, the use of NTA as a non and use of detergents, the use of NTA as substitute, and those forces affecting industrial producers. The effects of social and scientific concern on the legislation are also discussed. (Mackan-Battelle) W72-12708

NATURAL ABUNDANCE OF THE STABLE ISOTOPES OF CARBON IN BIOLOGICAL SYSTEMS,

Texas Univ., Austin. Dept. of Botany. B. N. Smith.

BioScience, Vol 22, No 4, p 226-231, April 1972. 4 fig. 1 tab. 64 ref.

Descriptors: *Isotope studies, *Stable isotopes, *Carbon radioisotopes, Environmental effects, Methodology, Algae, Aquatic plants, Isotope fractionation, Carbon dioxide, Respiration, Marine plants, Bicarbonates, Mass spectrometry, Dis-

plants, Bicardonates, Mass spectrometry, Dis-tribution, Separation techniques.

Identifiers: *C-13, *C-12, Biological systems, Belemnitella americana, Terrestrial plants, Com-bustion, Isotope ratios, Spectrometry, Lichens, Mosses, Gymnosperms, Angiosperms.

The gaseous CO2 used in measuring the stable carbon isotopes, C-12 and C-13, is collected with specific apparatus from the combustion of organic material at 800-900 degrees C in excess oxygen or from respiration of living tissue. After collection, the gaseous CO2 is analyzed on an isotope ratio mass spectrometer. The C-13/C-12 ratio in any given sample is then compared with a standard -CO2 from the fossil carbonate skeleton of Belemnitella americana (PDB sub l) according to the function: delta C-13 per mil is equal to 1000 times the C-13/C-12 of the sample minus the C-13/C-12 of the standard divided by C-13/C-12 of the standard. The precision of measuring delta C 13 with the mass spectrometer is plus or minus 0.1 per mil. Results of these methods have shown marine and freshwater plants to have relatively more C-13 than most terrestrial plants. The presumed difference allowed for distinguishing between marine and freshwater sediments, plants and petroleum, and has suggested that environmental effects (e.g., temperature) may account for some of the isotopic fractionations in organisms and plants. (Mackan-Battelle)

LEAD IN A CONNECTICUT SALT MARSH, Yale Univ., New Haven, Conn. School of Forestry.

T. G. Siccama, and E. Porter. BioScience, Vol 22, No 4, p 232-234, April 1972. 2

fig. 2 tab. 6 ref.

Descriptors: *Salt marshes, *Lead, Retention, Heavy metals, *Path of pollutants, Estuarine environment, Separation techniques, *Connecticut, Absorption, Sulfides, Chelation, Organic com-pounds, Soil analysis, Spatial distribution, Profiles, Chemical analysis, Sampling.

Identifiers: *Atomic absorption spectrophotometry, Accumulation, Spartina patens, Spartina alterniflora, Phragmites communis, Typha augustifolia.

The examination of the possibility that salt marshes may serve as sinks for heavy metals trapped by chelation with complex organic molecules and/or precipitated as sulfides was accomplished by checking the horizontal and vertical distribution of lead in a Connecticut salt marsh in the upper reaches of East Haven River near New Haven. Grab samples and core samples were collected, dried at 100 C, a 2g sample ashed, the ash eluted with HNO3, and the lead in the elutant determined by atomic absorption

trophotometry. Lead concentrations in surface samples ranged from 9-190 ppm and in meter sam-ples from 3-123 ppm, decreasing downward to 20-30 cm and then becoming quite stable. It was con-cluded that salt marshes are effective in removing lead from inflowing waters from urban centers and that accumulation does take place in the soil as well as in the tissues of the higher plants and animals inhabiting the marsh. (Mackan-Battelle) W72-12710

PLANNING AND IMPLEMENTATION OF REMOTE SENSING EXPERIMENTS, Texas A and M Univ., College Station. Remote

Sensing Center. G. L. Huebner, Jr.

Available from the National Technical Information Service as AD-737 348, \$3.00 in paper copy, \$0.95 in microfiche. Final Report RSC 756-1, November 1971, 91 p. 14 ref. Contract No. N62306-71-C-0029.

Descriptors: *Remote sensing, *Aerial photography, *Water temperature, Water circulation, raphy, "Water temperature, Water circulation, Hydrography, Regional analysis, Gages, Currents (Water), "Estuaries, Mapping, Measurement, Monitoring, Upwelling, "Thermal pollution, Aircraft, Data collections, Instrumentation, Equip-Identifiers: Experimental design.

A study was conducted on the planning and implementation of remote sensing experiments. Two ex-periments were designed - investigation of water upwelling near the Virgin Islands and the other, coastal circulation and hydrographic effects of effluents from rivers into the northwestern Gulf of Mexico. Measurements were to be made from aircraft by remote-sensing instruments and correlated with surface observations. However, due to unfavorable conditions, aerial observations were impossible for the water upwelling experiment so the data were collected by four research vessels equipped with surface and subsurface temperature and salinity devices. Salinity and temperature values were then plotted against depth measure-ments. It was suggested that photographic data would be obtained from 15,000 feet while thermal measurements should be made with a light plane at much lower altitudes. (Long-Battelle)

LABORATORY EVALUATION OF RESIDUES MAINTAINED IN WATER TREATED WITH POLYVINYL CHLORIDE FORMULATIONS OF DURSBAN (TRADEMARK), Army Environmental Hygiene Agency, Edgewood

Arsenal, Md. L. L. Nelson, and T. A. Miller.

Available from the National Technical Informa-tion Service as AD-736 423, \$3.00 in paper copy, \$0.95 in microfiche. Report No. USAEHA-31-008-72, April-May 1971. 5 p. 2 fig. 1 ref.

Descriptors: *Pesticide residues, *Separation techniques, Insecticides, Water pollution sources, Water pollution effects, Gas chromatography, Pollutant identification, Water analysis.

Identifiers: *Dursban, *Polyvinyl chloride, *Plastisols, Electron capture gas chromatography,

Hexane, Organic solvents, Partitioning.

A laboratory study was conducted to determine residue levels that would be maintained in water treated with polyvinyl chloride plastisols (PVC) containing various concentrations of Dursban (trademark) (O,0 - diethyl-0- (3,5,6-trichloro-2-pyridyl) phosphorothioate). Water samples were taken weekly for 8 weeks and extracted by solvent partitioning using Nanograde hexane. Samples were subjected to three separate partitionings of 10, 5, and 5 ml, respectively. Dursban concentrations in the hexane fractions were determined by electron capture gas chromatography. The sen-sitivity of the method was 0.2 ppb Dursban.

Average residues over the test period were 70.2 ppb for 9.6 percent Dursban PVC, 76.8 ppb for 19.1 percent Dursban PVC, 67.3 ppb for 29.0 percent Dursban PVC, and 69.0 ppb for 37.8 percent Dursban PVC. All the formalations maintained residues in the water over an 8-week period, and it was concluded that differences in the percentage of Dursban in the formulations had little effect in the levels maintained in water. (Mortland-Battelle)

LABORATORY RELEASE RATE STUDIES OF DIAZINON AND SUPRACIDE (TRADEMARK) FROM POLYVINYL CHLORIDE FORMULA-

Army Environmental Hygiene Agency, Edgewood

Arsenal, Md.
L. L. Nelson, and J. T. Whitlaw, Jr.
L. Nelson, and J. T. Whitlaw, Jr.
Available from the National Technical Information Service as AD-736 422, \$3.00 in paper copy,
\$0.95 in microfiche. Report No. USAEHA-31-01971/72, 8 p, March 1971. 2 fig, 2 tab, 1 ref.

Descriptors: *Pesticide residues. *Diazinon. Descriptors: "Pesticide residues, "Diazinon, Separation techniques, Water pollution sources, Water pollution effects, Radioactivity techniques, Gas chromatography, Pollutant identification, Solvent extractions, Laboratory tests, Organophosphorus pesticides, Phosphothioate pesti-

Identifiers: *Polyvinyl chloride, *Supracide, C-14, Scintillation counting, Electron capture gas chromatography, Hexane, Organic solvents, Liquid scintillation.

Laboratory evaluations were conducted over an 8week period to determine the release rates and residue levels maintained in water treated with forresidue levels maintained in water treated with formulations of diazinon and Supracide in polyvinyl chloride (PVC). Both non-radioactive and radioactive C-14-labeled formulations were tested. Radioactive samples were taken weekly and analyzed by liquid scintillation counting. The scintillation fluid contained naphthalene, PPO (2,5-diphenyloazole), POPOP (1,4-bis-2 (5-phenyloxazoly)) benzene), xylene, dioxane, and ethylene glycol monoethyl ether. Weekly non-radioactive water samples were extracted by three separate water samples were extracted by three separate solvent partitionings of 10,5, and 5 ml, respective-ly, using nanograde hexane. Diazinon and Supracide concentrations in the fractions were determined by electron capture gas chromatography. The results indicated that the release rates of diazinon and Supracide from PVC are approximately linear with increasing percent composition. The released substances maintained residues for at least 8 weeks in the laboratory. (Mortland-Battelle) W72-12714

MODELS OF ION AND SUBSTRATE COTRANSPORT AND THE EFFECT OF THE

MEMBRANE POTENTIAL,
Michigan Univ., Ann Arbor. Dept. of Physiology;
Michigan Univ., Ann Arbor. Medical School; and gan Univ., Ann Arbor. Dept. of Biostatistics. J. A. Jacquez.

Mathematical Biosciences, Vol 13, No 1/2, p 7193, February 1972. 6 fig, 1 tab, 67 ref.

Descriptors: *Mathematical models, *Ions, Model studies, Ion transport, Carriers, Equilibrium, Kinetics, Membrane processes, Water pollution

Identifiers: *Cotransport, *Substrates, *Carrier models, Membrane potential.

Several mathematical expressions have been used to illustrate the implications of a carrier model of ion and substrate cotransport. In the carrier model, each carrier is assumed to have one ion and one substrate binding site. The model includes fea-tures that have not been included in previously published models. These features are the effect of the membrane potential and of the assumption that all carrier forms, with or without bound substrate and with or without various bound ions, can cross the membrane. The model is of a two-state (gate-type) carrier with transition rate constants. In one state the carrier interacts with outer bulk phase; in the other state it interacts with the inner bulk phase. Equilibrium in the reactions between ion, substrate, and carrier is assumed at each surface.
(Mackan-Battelle)

THE GRADUAL DESTRUCTION OF SWEDEN'S

LAKES, National Swedish Environment Protection Board,

Stockholm.
For primary bibliographic entry see Field 05C. W72-12729

MERCURY ACCUMULATION IN FOOD

CHAINS, Swedish Water and Air Pollution Research Lab., Stockholm.

A. Jernelov, and H. Lann. Oikos, Vol 22, No 3, p 403-405, 1971. 2 fig, 1 tab, 6

Descriptors: *Mercury, *Benthic fauna, Preda-tion, *Food chains, Nutrition, Pikes, Aquatic animals, Bottomfish, Sediments, Absorption, Metals, Heavy metals, Water pollution, Water pol-lution sources, Water pollution effects.

Identifiers: Liver, Muscle, Kidneys, Esox lucius, Sweden, *Methyl mercury, Phenyl mercury, Tissue, Delangeran River, Lake Vanern, Lake Hjalmaren, Bioaccumulation.

The total mercury content of benthic animals is found to be of little value when calculating the rate of mercury transport from benthic animals to predatory fish. Tissue analysis that reveals the percentage of methyl mercury in total mercury percentage of methyl mercury in total mercury content of benthos is much lower than the percent-age in fish and the total mercury content is varia-ble. Methyl mercury transport from benthic fauna to bottom-feeding fish appears insignificant and it seems that Hg bioaccumulation is actually a func-tion of a predator adding uptake from water to a 'basic level' found in the food chain. (Snyder-Bat-W72-12730

UPSTREAM MOVEMENTS OF GAMMARUS PULEX PULEX (AMPHIPODA) IN A SOUTH SWEDISH STREAM, Lund Univ. (Sweden). Dept. of Animal Ecology.

For primary bibliographic entry see Field 05C.

DECONTAMINATION OF RADIOACTIVITY INFECTED WATER BY PEAT, (DEKON-TAMINIERUNG RADIOAKTIV VERSEUCHTEN WASSEDS MIT TODE)

Schweizerische Zeitschrift fuer Hydrologie, Vol 32, No 1, p 226-270, June 30, 1970. 23 fig, 10 tab, 22 ref.

Descriptors: *Radioactive wastes, *Peat, *Cation Descriptors: *Radioactive wastes, *Peat, *Cation exchange, Nuclear wastes, Soils, Rainfall, Iodine, *Iodine radioisotopes, Radioisotopes, Strontium, *Strontium radioisotopes, Yttrium, *Yttrium radioisotopes, Anion exchange, Calcium, Cations, Percolation, Alkaline earth metals, Anions, Radioecology, Water pollution, Adsorption.

Identifiers: *Switzerland, Jura mountains, Decontainestics. Perceivel 1121 Sci. 90, 900. tamination, Removal, I-131, Sr-90, Y-90.

Experiments were carried out to determine the decontamination of rain and model water containing Strontium-90-Yttrium 90, Iodine 131 by various peats. The chemical composition of the model water was similar to rain, especially, cistern water. Peat samples were taken in the Jura mountains,

Neuchatel region, Switzerland and percolation experiments carried out in laboratory ion-exchange columns of the usual dimensions and in pilot scale installations to determine the decontamination capacity of three types of peats. Good decon-tamination effects were determined for Strontium 90-Yttrium 90. The main parameters influencing the breakthrough capacity are: type of peat, degree of drying, and deep freezing. In addit other factors, particularly those with regard to exchange capacity, are also significant. A mea-surable retention of anionically available Iodine-131 was observed only at extremely low concenrations less than 1 nanomole NaI/liter. Retention increases exponentially with increasing dilution ratios. A solution of less than 1 picomole I-131-labeled NaI/liter showed a retained activity of 60 to 90 percent, related to the inflowing solu The experiments yielded useful findings with regard to soil science. Particularly interesting are the irreversible structure changes of peat due to deep freezing and drying, and the correlation between calcium content or degree of decomposition and exchange or breakthrough capacity for cations. (Mortland-Battelle) W72-12735

BIODEGRADATION OF NITROLOTRIACETIC ACID AND RELATED IMINO AND AMINO ACIDS IN RIVER WATER, Monsanto Co., St. Louis, Mo.

C. B. Warren, and E. J. Malec. Science, Vol 176, No 4032, p 277-279, April 21, 1972. 1 fig, 1 tab, 20 ref.

Descriptors: *Biodegradation, *Nitrolotriacetic acid, *Amino acids, Organic acids, Organic compounds, *Gas chromatography, Methodology, Aquatic environment, Chromatography. Identifiers: *Imino acids, *Detroit River, N-methyliminodiacetic acid, Iminodiacetic acid, Sarcosine, Glycine, *Meramec River, N N-dimethyl-glycine, N-nitrosoiminodiacetic acid.

A gas chromatographic procedure is capable of: (1) the quantitative detection of nitrilotriacetic acid, N-methyliminodiacetic acid, iminodiacetic acid, sarcosine, and glycine, and (2) the qualitative detection of N.N-dimethylglycine and N-nitrosoiminodiacetic acid in river water, primary, and secondary sewage effluent and water containing nitrite ions. The method has been used to search for intermediates during and after the degradation of NTA and to determine the biodegradability of NTA, NMIDA, IDA, SARC, GLY, and N-nitroso IDA. When the amino acids were added to samples from the Detroit and Meramec Rivers, they were completely degraded at approximately equal rates, with no accumula-tion of intermediates. NTA was always completely degraded when added to water from either of the rivers. There was accumulation of the above amino acids, no appearance of new gas chromato-graphic peaks, or any clues obtained about its biodegradation pathway. (Holoman-Battelle) W72-12743

ABSENCE OF CHLORINATED DIBENZODIOX-INS AND DIBENZOFURANS FROM AQUATIC ANIMALS, Fisheries Research Board of Canada, St. Andrews

(New Brunswick). Biological Station. For primary bibliographic entry see Field 05A. W72-12745

ORGANIC EXCRETION BY DUNALIELLA

TERTIOLECTA,
Duke Univ., Beaufort, N.C. Marine Lab.
For primary bibliographic entry see Field 05C. W72-12750

PRECIPITATION SCAVENGING (1970).

Available from NTIS, Springfield, Va 22151 as CONF-700601, Price \$6.00 (paper copy). Proceedings of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, December 1970. 499 p.

Descriptors: *Conferences, *Air pollution, *Nucleation, *Fallout, *Water pollution sources, Documentation, Precipitation (Atmospheric), Cloud physics, Meteorology, Particle size, Pollutant identification, Rainfall, Gases, Aerosols, Model studies, Forecasting, Mathematical studies,

Analytical techniques.

Identifiers: *Precipitation scavenging, *Airborne pollutants, Particle transport.

The proceedings of a symposium concerning the removal of airborne particles and gases by precipitation are presented. The symposium, held at Richland, Washington, June 2-4, 1970, was sponsored by Pacific Northwest Laboratory, Battelle Memorial Institute, and U. S. Atomic Energy Commission. Thirty-six technical papers were presented under five main topics: (1) field experiments; (2) laboratory experiments and techniques; (3) scavenging of gases; (4) microphysics in scavenging; and (5) models and predictions. Air pollution sources are operated without regard as to whether precipitation occurs. The prediction of scavenging is one of combining precipitation climatology with what is known about below-cloud and in-cloud scavenging so that for a particular source a calculation can be made of deposition on a climatological basis. The afforts of contaminated a climatological basis. The effects of contaminated precipitation on surface waters and vegetation are of concern. (See W72-12753 thru W72-12788) (Woodard-USGS) W72-12752

RADAR OBSERVATIONS OF CONVECTIVE STORM CIRCULATION AND ITS RELATION TO PRECIPITATION SCAVENGING, National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab. R. M. Lhermitte.

R. M. Lhermitte.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 13-20, December 1970. 3 fig, 15 ref.

Descriptors: *Precipitation (Atmospheric),
*Storms, *Air pollution, *Fallout, *Pollution
abatement, Radar, Self-purification, Atmosphere,
Hydrologic cycle, Clouds, Forecasting, Rainfall,
Nucleation, Convection, Weather
Analytical techniques, Water pollution. Identifiers: *Precipitation scavenging, Storm cir-

The use of radar for probing convective storms is reviewed. Emphasis is placed on Doppler radar methods that probe precipitation-particle motion and thereby provide information on storm circulaand thereby provide information on storm circula-tion. Also discussed is a vertically pointing Dop-pler radar, which enables the evaluation of precipitation particle size spectra from observa-tions of vertical particle velocity distribution. Comments are included on the applicability of these methods to the study of scavenging by precipitation. (See also W72-12752) (Woodard-USGS) W72-12753

SCAVENGING OF TRACER IN SEVERE

STORMS, Michigan Univ., Ann Arbor. Dept. of Meteorology and Oceanography. A. N. Dingle.

Group 5B-Sources of Pollution

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 21-35, December 1970. 7 fig, 10 ref.

Descriptors: *Pollution abatement, *Air pollution, *Fallout, *Precipitation (Atmospheric), *Storms, Tracers, Analytical techniques, Cloud physics, Nucleation, Particle size, Humidity, Condensation, Atmosphere, Water pollution, Meteorology, Climatology, Rain gages, Radar. Identifiers: Air-blown particles, Airborne water.

Field experiments designed to study severe storms by tracer scavenging are presented. Criteria used in the selection of indium as an atmospheric tracer and in choosing the emission and placement techniques are discussed. Specific experiments using updraft inoculation and middle-level indraft air labeling are outlined, and idealized flight plans and deposition patterns for these are presented. Finally, the operational procedure used in the field experiments is given. (See also W72-12752) (Woodard-USGS) W72-12754

INTERACTIONS OF CLOUD CONDENSATION NUCLEI AND ICE NUCLEI WITH CLOUD AND PRECIPITATION ELEMENTS: A REVIEW, Washington Univ., Seattle. Dept of Atmospheric Sciences.

L. F. Radke, W. D. Scott, and C. E. Robertson.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 37-48, December 1970. 7 fig, 15 ref. NSF Grant GA 17381 and WSU Contract 14-06-D-5970.

Descriptors: *Precipitation (Atmospheric), *Nucleation, *Fallout, *Chemistry of precipitation, *Clouds, Ice, Condensation, Rainfall, Snowfall, Air pollution, Water pollution, Reviews, Analytical techniques.

Identifiers: *Precipitation scavenging, Cloud condensation nuclei.

Ground and aircraft measurements showing the effects of rainfall, snowfall, and cloud formation and evaporation on the concentration of cloud condensation nuclei (CCN) and ice nuclei (natural and artificial) are reviewed. Cumulus clouds are shown to be sinks for CCN when they are growing and sources of CCN when they evaporate. The removal of sea-salt nuclei by precipitating stratiform over the ocean is detailed. Snowfall is relatively ineffective in scavenging artificial ice nuclei. The effect of the onset of rain during shower activity is discussed with reference to icenuclei concentration. (See also W72-12752) (Woodard-USGS)

ENTRY OF FREEZING NUCLEI INTO PRECIPITATION, Wyoming Univ., Laramie. Natural Resources

Wyoming Univ., Laramie. Natural Resources Research Inst. G. Vali.

On tall: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 49-68, December 1970. 13 fig, 15 ref. NSF Grant 1527, Bur Reclam Contract/14-06-D-6801.

Descriptors: *Precipitation (Atmospheric), *Nucleation, *Ice, *Hail, *Convection, Rainfall intensity, Time, Heat transfer, Fallout, Air pollution, Water pollution, Storms, Chemistry of precipitation, Clouds.

Identifiers: *Precipitation scavenging, Freezing nuclei.

Variations of the concentrations of freezing nuclei in convective-type rain with variations of time and rate of rainfall were investigated. There was a direct relation between rate of rainfall and nucleus content: almost 50% higher concentrations for each 10 mm/hr increase in rainfall rate. The nucleus content of hailstones is relatively uniform throughout the volumes of the stones. Rain and hail occurring simultaneously have very nearly identical concentrations of nuclei. Freezing nuclei are transferred to cloud droplets by diffusion and take an active role in initiating precipitation. This concept is supported by the fact that appreciable fractions of the nuclei are only hundredths of microns in diameter. (See also W72-12752) (Woodard-USGS) W72-12756

IN-CLOUD SCAVENGING ANALYSIS FROM COSMOGENIC RADIONUCLIDE MEASURE-

Battelle-Pacific Northwest Labs., Richland, Wash.

R. W. Perkins, C. W. Thomas, J. A. Young, and B. C. Scott.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 69-97, December 1970. 11 fig, 2 tab, 10 ref. AEC Contract AT (45-1)-1830.

Descriptors: *Precipitation (Atmospheric), *Air pollution, *Fallout, *Radioactivity, *Pollutant identification, Analytical techniques, Gamma rays, Spectrometers, Clouds, Rainfall, Nucleation.

Identifiers: *Precipitation scavenging, Airborne water.

A technology was developed for the measurement of the short-lived cosmogenic radionuclides Na-24, Cl-38, and Cl-39 in water from a rainstorm during consecutive sampling periods down to minutes in duration. The technique involves collecting Na-24, and Cl-38 and Cl-39, on cation-and anion-resin beds and counting them directly on multidimensional gamma-ray spectrometers. Passing the rainwater through an Al203 bed before it goes to the ion-exchange beds removes the radon daughter Bi-214, which would otherwise be retained on anion-exchange beds and cause some interference in the radiochlorine measurements. The radionuclides can be measured with a precision of better than plus or minus 10%, which provides excellent resolution for studying in-cloud processes. (See also W72-12752) (Woodard-USGS)

STABLE ELEMENTS OF THE ATMOSPHERE AS TRACERS OF PRECIPITATION SCAVENGING,

Battelle-Pacific Northwest Labs., Richland, Wash.

L. A. Rancitelli, R. W. Perkins, T. M. Tanner, and C. W. Thomas.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 99-108, December 1970. 2 fig, 4 tab, 14 ref. AEC Contract AT (945-1)-1830.

Descriptors: *Precipitation (Atmospheric), *Rain water, *Pollutant identification, *Fallout, Analytical techniques, Sampling, Data collections, Nucleation, Chemical analysis, Water analysis, Water pollution sources, Trace elements, Elements (Chemical).

Identifiers: *Precipitation scavenging.

Rainwater samples collected at Quillayute, Wash, were analyzed by a multielement technique of neutron activation analysis to estimate the origin and removal rates of atmospheric aerosols. The concentrations of 19 elements measured in each sample were compared with concentrations in seawater and the earth's crust to establish the origin of each element. The Na, Cl, and Br are primarily of marine origin; the Sc, Co, Mn, K, Cr, Rb, and Cs could come from continental dust. The Ag, Se, Sb, As, Zn, and possibly Cu appear to have origins independent of the marine aerosol or continental dust. Scavenging coefficients were estimated from the concentrations of Co, Fe, Sc, and Sb in rainwater and known trace-element profiles in the atmosphere. (See also W72-12752) (Woodard-USGS)

CONCENTRATION VARIATION OF SOME TRACE METALS IN PRECIPITATION FROM GREAT PLAINS THUNDERSTORMS, Chadron Atmospheric Research Inst., Nebr.

D. H. Steffe.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and US Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 109-120, December 1970. 3 fig, 2 tab, 2 ref.

Descriptors: *Precipitation (Atmospheric), *Chemical analysis, *Fallout, *Trace elements, *Thunderstorms, Analytical techniques, Spectrophotometry, Zinc, Data collections, Rain water, Hail, Nucleation.

Identifiers: *Silver, Atomic absorption spectrophotometer.

In the summer of 1969, sequential rain and hail samples were collected from several thunderstorms in western South Dakota and Nebraska. Samples were collected in rapid time sequence at a fixed geographical point in the path of the most intense storm activity. The samples were analyzed for concentrations of zinc and silver using an atomic absorption spectrophotometer. Both silver and zinc concentrations in rain generally decreased with time but sometimes varied sharply deports to 5 pg/ml in 5 min). The silver and zinc concentrations in hail were always as high as, or higher than, those of the accompanying rain. The distribution of silver in the precipitation was of particular interest because silver looked promising as a future tracer element in dynamic cloud studies. Impetus was added to the study of silver distribution by the interest of several groups using silver iodide as a seeding agent in weather-modification activities. Zinc was selected so that there would be an alternate element with which to compare the behavior of the silver through the precipitation shaft. (See also W72-12752) (Woodard-USGS) W72-12759

SCAVENGING BY SNOW AND ICE CRYSTALS, Illinois Inst. of Tech., Chicago. S. K. Sood, and M. R. Jackson.

S. K. SOOI, and M. K. Jackson. In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 121-136, December 1970. 13 Fig, 3 tab, 11 ref. AEC Contract AT (11-1)-578-32.

Descriptors: *Precipitation (Atmospheric), *Air pollution, *Aerosols, *Pollution abatement, *Snowfall, Sodium chloride, Self-purification, Atmosphere, Chemical analysis, Analytical techniques, Data collections, Nucleation. Identifiers: *Precipitation scaepaing. Airhorne

Identifiers: *Precipitation scavenging, Airborne particles, Polystyrene latex, Sodium chloride aerosols.

The scavenging efficiency of naturally precipitating snow and ice crystals was determined for submicron polystyrene latex and sodium chloride aerosols. The effect of crystal habit, crystal dimensions, and particle size on scavenging efficiency is a function of both the crystal diameter and the particle dimensions. function of both the crystal diameter and the parti-cle diameter. The scavenging efficiency of snow and ice crystals is independent of crystal habit for the particles studied. The scavenging efficiency in-creases with decreasing crystal diameter. There is a minimum scavenging efficiency of snow and ice crystals for particles in the size range 0.3 to 0.5 microns. (See also W72-12752) (Woodard-USGS) W72-12766. W72-12760

SCAVENGING OF SOLUBLE DYE PARTICLES

BY RAIN, Battelle-Pacific Northwest Labs. Richland, Wash. M. T. Dana.

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In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 137-147, December 1970. 5 fig. 1 tab, 9 ref. AEC Contract AT (45-1)-1830.

Descriptors: *Air pollution, *Pollution abatement, *Precipitation (Atmospheric), *Self purification, *Tracking techniques, Tracers, Fluorescent dye, Rhodamine, Particle size, Rainfall, Deta collections, Analytical techniques, Mathematical studies, Meteorological data, Path of pollutants, Nucleation Nucleation.

Identifiers: *Precipitation scavenging, Airborne particles.

A number of precipitation scavenging field experi-ments using uranin and rhodamine dye particles ments using uranin and rhodamine dye particles were conducted at an Olympic Peninsula (Wash.) field site. Most experiments employed air-jet atomization of a methanol solution of the tracer; variation of the solution concentration produce tracer plumes of selectable particle size. Mass median particle radii (unit density equivalent) for the experiments ranged from 0.4 to 7.5 microns. For particle radii of 3 microns and larger, experimental washout coefficients agreed with those expected from the theory of inertial capture. Smaller particle experiments showed much higher washout than theory—as much as 10 times higher for particles of about 0.5 micron radius. There is some evidence that electrical effects contributed to the evidence that electrical effects contributed to the scavenging of the smaller particles. (See also W72-12752) (Woodard-USGS) W72-12761

COLLECTION EFFICIENCIES OF RAINDROPS FOR SUBMICRON PARTICULATES, Illinois State Water Survey, Urbana. J. R. Adam, and R. G. Semonin.

J. R. Adam, and R. G. Semonin.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U. Atomic Energy Comm, Div of Biology and Medicine: U. S. Atomic Energy Comm Symposium Series 22, p. 151-160, December 1970. 5 fig., 4 ref. AEC Contract AT (1199) NSF Grant GA-4576.

Descriptors: *Air pollution, *Spores, *Pollution abatement, *Precipitation (Atmospheric), *Pollutant identification, Laboratory tests, Cultures, Raindrops, Analytical techniques, Nucleation. Identifiers: *Precipitation scavenging, Airborne sociales, Pacillies abolisis. particles, Bacillus subtilis,

The scavenging efficiency of raindrops falling at terminal velocity for submicron biological aerosols was determined. The experimental apparatus and methods used to produce the simulated raindrops and the aerosol are discussed. Determined scavenging efficiencies of raindrops for 1-micron Bacillus subtilis spores are presented. The amount of material scavenged is very small, approximately 0.004% for a 2-mm-diameter drop. The scavenging efficiency increases exponentially with decreasing drop size to a value of 0.4% for a 0.4-mm drop. Also, electric charge on the drop dramatically increases the collection of the submicron particulates. (See also W72-12752) (Woodard-USGS)

COLLECTION EFFICIENCY OF WATER DROPLETS IN AGCL AEROSOL, Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemistry; and Clarkson Coll. of Technology, Pottsdam, N.Y. Inst. of Colloid and Surface Science Surface Science

Surface Science.

M. Kerker, E. Matijevic, V. Hampl, and D. Cooke.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and US Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 161-167, December 1970. 1 fig, 1 tab, 6 ref.

Descriptors: *Precipitation (Atmospheric), *Aerosols, *Silver iodide, *Air pollution, *Laboratory tests, Analytical techniques, Instrumentation, Neutron activation analysis, Colorimetry, Nucleation.

Identifiers: *Precipitation scavenging, Airborne

A laboratory study describes the collection efficiency of water droplets falling through an aerosol of AgCl particles with a narrow distribution of particle sizes. The aerosol is prepared thermally and is contained in a specially constructed chamber. The particle size distribution is obtained by light scat-tering. The mass concentration is determined by derect weighing after collection by thermal precipitation. A water droplet of known weight drops from a hypodermic syringe through a light beam; breaking the beam activates a circuit that automatically opens and shuts a pair of shutters at the entrance and the exit of the scavenging column and permits the droplet to fall through the aerosol.

The amount of AgCl collected is determined both by neutron activation analysis and by a colorimetric microchemical analysis. A collection efficiency was less than 0.01% for an aerosol with radii in the range of 0.3 microns and with particle concentrations of about 1 million per liter. (See also W72-12752) (Woodard-USGS) W72-12763

COLLECTION EFFICIENCY IN WASHOUT BY

RAIN, Berg (T. G. Owe), Inc., Garden Grove, Calif. T. G. O. Berg.

T. G. O. Berg.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 169-186, December 1970. 9 fig, 26 ref.

Descriptors: *Precipitation (Atmospheric), *Air pollution, *Fallout, *Rainfall, *Water pollution sources, Pollution abatement, Pollutants, Particle size, Dusts, Nucleation.
Identifiers: *Precipitation scavenging, Airborne

The scavenging of atmospheric dust particles by falling raindrops is, in a sense, a fairly simple and straightforward problem of aerodynamics. It is enormously complicated by the solution of the nonlinear Navier-Stokes equations in the region between viscous flow at very small Reynolds numbers and potential flow at large Reynolds numbers, but approximate solutions have been worked out. Experimental data on collision efficiencies show experimental data on comision efficiencies among some discrepancies among themselves and with respect to the theory. Thus collection on the back side of the scavenger has been reported as being in the range from nothing to 131 times that on the front side. The theory disregards collection on the back side. There are also discrepancies in the optimum scavenger size. These are explainable, but the collection on the back side poses a serious problem that needs study. (See also W72-12752) (Woodard-USGS) W72-12762

SCAVENGING OF AEROSOL PARTICLES BY

SPRAYS, Battelle-Pacific Northwest Labs., Richland,

Wash.

J. D. McCormack, and R. K. Hilliard.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 187-204, December 1970. 8 fig. 8 tab, 4 ref. AEC Contract AT (45-1)-1830.

Descriptors: *Fallout, *Air pollution, *Spraying, Descriptors: "Failout, "Air poliution, "Spraying, "Aerosols, "Laboratory tests, Analytical techniques, Model studies, Nucleation, Particle size, Cesium, Iodine, Pollution abatement, Laboratory equipment.

Identifiers: "Spray scavenging, Aqueous sprays,

Uranium oxide particles.

Eight experiments are described in which the washout of aerosol particles by aqueous sprays in a closed chamber was measured. The chamber volume was 750 cubic meters, and the average fall distance for drops was 11.6m. Experimental conditions covered a range of those expected in a containment vessel following a loss-of-coolant accident in a pressurized water reactor, including room-temperature air. The washout of three types of aerosol particles was measured: water-soluble cesium and iodine particles and insoluble uranium oxide particles. The time-dependent mass concentrations of these aerosol materials were measured at many locations within the enclosed gas space. A model was developed which described the particle washout by relating the washout coefficient to the single-drop collection efficiency. The washout of all particle types was significantly higher than predicted by the model using particle sizes measured by cascade impactor sampling during the tests. Drop-collection efficiencies for capturing cesium and particulate iodine decreased with spraying time from about 0.04 to about 0.005. Efficiencies for uranium were about half the magnitude indicated for the soluble particles. (See also W72-12752) (Woodard-USGS) W72-12765

CONTINUOUS CHARGED CLOUD-PARTICLE

CONTINUOUS CHARGED CLOOD AND AND ADDRESS AMPLER,
Manchester Univ. (England). Dept. of Physics.
C. P. R. Saunders, M. H. Smith, and J. Latham.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsosium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and US Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 205-212, December 1970. 4 fig, 1 tab, 12 ref.

Descriptors: *Clouds, *Particle size, *Particle shape, Cloud physics, Instrumentation, Electric currents, Electrical properties, Analytical techniques, Air pollution, Precipitation (Atmospheric), Ice, Volume, Nucleation.

Identifiers: *Cloud-particle sampler, Airborne par-

An instrument was designed which will measure An instrument was designed which will measure continuously the charge and dimensions of individual ice crystals or water droplets within clouds, particle-size distribution, and volume charge densities inside clouds. A collimated beam of particles passes through a transverse electric field before impinging on a moving belt of 35-mm film coated with Fromvar which has been softened.

immediately before exposure to the beam. Each

Group 5B-Sources of Pollution

particle is deflected by an amount proportional to its chargeeto-mass ratio. The dimensions, type, and charge of each collected particle can therefore be determined by subsequent analysis of the replicas, using a stop-motion projector allied to a data-recording system. If required, the dimensions of selected particles can be determined more precisely by a scanning electron microscope. (See also W72-12752) (Woodard-USGS)

PULSED-LASER HOLOGRAPHY FOR ANALYSIS OF PARTICLE SIZE AND DISTRIBUTION. Northwest Labs., Richland, Wash

F. R. Reich, and B. P. Hildebrand.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 213-216, December 1970. 2 fig, 10 ref.

Descriptors: *Cloud physics, *Fallout, *Particle size, *Distribution patterns, Analytical techniques, Instrumentation, Light penetration, Deflection, Nucleation.
Identifiers: *Laser, Holography.

The potential of holography in cloud physics can best be pointed out by describing the holographic process and the unique properties of a hologram. Basically a hologram is a recording of an optical wave front since both phase and amplitude information can be obtained from the hologram. The principles of pulsed-laser holography and its application to particle studies are reviewed. Holography is an interferometric technique for recording a three-dimensional scene or volume on a twodimensional medium such as film. The image retains the three dimensionality of the scene along with depth of focus and parallax. This technique is useful for the study of particle distributions since the hologram can be made with a laser having pulse lengths in the microsecond to nanosecond range, in effect stopping any particle motion. Some experimental results are shown. (See also W72-12752) (Woodard-USGS) W72-12767

THERMAL-DIFFUSION CHAMBERS AS CLOUD-NUCLEI COUNTERS. Missouri Univ., Rolla. Graduate Center for Cloud

Physics Research.

V. K. Saxena, and J. L. Kassner, Jr. In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 217-238, December 1970. 5 fig, 1 tab, 97 ref. OWR THEMIS Contract N00014-68-A-

Descriptors: *Cloud physics, *Fallout, *Measurement, *Particle size, *Thermal properties, Instrumentation, Evaluation, Design criteria, Air pollution, Radioactivity, Nucleation.

Identifiers: *Cloud-nuclei counters, *Thermal-dif-

fusion chambers

Thermal-diffusion chambers were introduced 30 years ago to detect rare nuclear particles in clouds. During the last decade they have been so widely used in these investigations that all information available regarding the variation in concentration of cloud nuclei may be considered as acquired with these chambers. They are readily adaptable to the production, maintenance, and control of low supersaturations such as those encountered in natural cloud formation. In contrast to their application to nuclear particle detection, the operation of thermal-diffusion chambers for cloud nuclei counting brings in a transient effect associated with the sample introduction. Also, two other detrimental effects accompany the wall heating and vapor depletion and may cause uncertainty in measurements. Depending upon the operating persaturations, there are some limitations on the counting technique used with these chambers, which has usually been direct photography of the sensitive region. In the light of these findings, the designs of existing thermal-diffusion chambers are designs of exhibit designs of the suggestions outlined for future improvement in their performance. (See also W72-12752) (Woodard-USGS) W72-12768

AUTOMATIC SEQUENTIAL RAIN SAMPLER FOR SCAVENGING STUDIES, Argonne National Lab., Ill. Radiological Physics

D. F. Gatz, R. F. Selman, R. K. Langs, and R. B.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest I Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 239-244, December 1970. 2 fig, 1 tab, 5

Descriptors: *Rain water, *Sampling, *Chemical analysis, *Instrumentation, *Automation, Methodology, Rainfall, Fallout, Air pollution, Water pollution sources, Nucleation. Identifiers: *Rain sampler (Automatic).

A sequential rain sampler for chemical analysis is described that collects up to 70 samples with volumes of 500 to 1000 ml from each 0.5 mm to 1.0 mm of rain. Any additional rain is automatically discharged. The area of the collector is 1 sq m. All surfaces touched by the rainwater, including the bottles used to contain the samples, are polyethylene or Teflon. After every sample an event mark is recorded on a strip chart; after the first mark the chart speed increases from 1.5 in/hr to 1.5 in/min. This provides adequate resolution between event marks for the computation of rain-fall rate. If a time reference is provided while the chart is on fast speed, the starting and ending times of individual samples are known to within I The sampler can operate unattended during rain for a time period that depends on the length of strip chart left when the fast chart drive is activated. (See also W72-12752) (Woodard-USGS) W72-12769

EFFECTS OF SOLUBILITIES OF GASES ON THEIR SCAVENGING BY RAINDROPS,

Northwest Labs.. Richland,

Wash. A. K. Postma

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm. Symposium Series 22, p 247-259, December 1970. 8 fig, 7 ref.

Descriptors: *Rainfall, *Fallout, *Gases, *Solubility, Reviews, Chemical reactions, Air pollution, Pollution abatement, Water pollution sources, Pollutants, Diffusivity, Numerical analysis, Nuclea-

Identifiers: *Rainfall scavenging.

Raindrops absorb atmospheric gases and thus provide an important mechanism for cleaning the earth's atmosphere. The relative effectiveness of scavenging of gases by falling drops depends on physical parameters, such as drop size, pollutant concentration, solute gas diffusivity, and equilibrium solubility of the absorbed gas in water. Equilibrium solubility is one of the most important physical parameters in drop scavenging because this parameter limits the maximum amount of solute gas that can be absorbed by a given drop. Existing data on gas absorption raindrops are

reviewed to show the relative importance of solubility on scavenging in the atmosphere. Numerical examples of washout coefficients for a number of examples of washout coefficients for a number of gases show the influence of solubility and chemi-cal reaction. Information needed to predict drop absorption rates for specific cases is reviewed. (See also W72-12752) (Woodard-USGS) W72-12770

LABORATORY INVESTIGATIONS ON WASHOUT OF TRACE GASES, Frankfurt Univ. (West Germany). Institut fuer Meteorologie und Geophysik. S. Beilke.

S. Deike.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 261-269, December 1970. 6 fig, 5 ref.

Descriptors: *Rainfall, *Air pollution, *Fallout, *Gases, *Laboratory tests, Analytical techniques, Water pollution sources, Pollution abatement, Laboratory equipment, Nucleation.
Identifiers: *Rainfall scavenging, Washout, Trace

Laboratory investigations are discussed on the washout by rainfall of SO2, NO2, and CO2. The order of magnitude of trace-gas washout coefficients was determined, and the reasons for different washout behavior of these three gases are explored. The artificial rain could be varied in intensity as well as in droplet size. Droplets of different sizes were generated by varying the diameters of the nozzles. The intensity of the artificial rain was varied by changing the number of nozzles with equal diameter. Since the nozzles were installed at the bottom, the drops followed ballistic trajectories. The disadvantage of this experiment compared with experiments in the atmosphere is that the speed of free-falling droplets is greater in the atmosphere than the mean velocity of droplets with the same size in the chamber. The different Sherwood numbers, however, determine the deviation. How high the concentration of a trace gas can be and still be considered completely absorbed depends essentially on the solubility of the trace gas in water. (See also W72-12752) (Woodard-USGS) W72-12771

WASHOUT OF GASEOUS IODINE SPECIES, Battelle-Pacific Northwest Labs., Richland,

. F. Coleman, and A. K. Postm L. F. Coleman, and A. K. Postma.

In: Precipitation Scavenging (1970); Proc Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 271-288, December 1970. 8 fig, 12 ref. AEC Contract AT (45-1) 1830.

Descriptors: *Fallout, *Air pollution, *Iodine, Descriptors: "Falout, AI Pollution, Availle, "Gases, "Spraying, Laboratory tests, Analytical techniques, Particle size, Pollution abatement, Laboratory equipment, Nucleation. Identifiers: "Spray scavenging, Aqueous sprays.

Eight experiments were made to measure the washout of airborne iodine species by aqueous sprays. The spray chamber volume was 750 cubic meters and the average drop fall distance was 11.6 m. The spray drop size was 0.77 or 1.2 mm volume median diameter. Other parameters considered were temperature, spray flow rate, and spray solution composition. Spray washout models are presented for elemental iodine and methyl iodide. Absorption rates measured for elemental iodine with the theoretical model based on mass transfer limited by gas-phase resistance. Methyl iodide washout was in agreement with a model based on absorption with simultaneous reaction. (See also W72-12752) (Woodard-USGS) W72-12772

INTEREST ACIDIC PRECIPITATION: A REVIEW,
Battelle Memorial Inst., Seattle, Wash. Research Center. H. Reiquam.

H. Reiquam.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 289-292, December 1970. 1 tab.

Descriptors: *Air pollution, *Path of pollutants, *Fallout, *Water pollution sources, *Precipitation (Atmospheric), Gases, Acidic water, Industrial wastes, Reviews, Nucleation, Pollution abatement Identifiers: *Precipitation scavenging

There is evidence that sulfur dioxide emitted in industrialized nations contributes to the acidity of precipitation far downwind. Some of that evidence is reviewed. Among the problems associated with long-range transport of air pollutants are poor understanding of the reactions, reaction rates, and removal mechanisms, which determine the residence time of pollutants, and the lack of current data on air and precipitation chemistry worldwide. An effective precipitation chemistry observation network would be an obvious first step toward providing factual response. (See also W72-12752) (Woodard-USGS) W72-12773

WASHOUT OF SO2 FROM THE PLUME OF A COAL-FIRED POWER PLANT,
Battelle-Pacific Northwest Labs., Richland,

J. M. Hales, J. M. Thorp, and M. A. Wolf. In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U.S. Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 293-303, December 1970. 8 fig, 5 ref. NAPCA Contract CPA22-69.

Descriptors: *Air pollution, *Fallout, *Industrial wastes, *Sulfides, *Water pollution sources, Precipitation (Atmospheric), Gases, Power plants, Coals, Data collections, Sampling, Rainfall, Pollution abatement, Sulfates, Nucleation. Identifiers: *Precipitation scavenging, Sulfur diox-

Field measurements of washout by rain and snow of SO2 in plumes from 800-ft stacks at the world's largest mine-mouth electric power generating plant demonstrate some complexities arising from the interaction of meteorological and physicochemical interaction of meteorological and physicochemical factors. Tall stacks are necessary to provide dilution of the stack effluent so as to avoid intolerable concentrations at the ground. The Keystom generating station in western Pennsylvania has two 800-ft stacks to elevate the gaseous effluent. from the 7800 tons of coal consumed daily in the production of 1800 Mw of power. Large sources of SO2 comparable to the Keystone station do not exist within the same distances to the samplers. Consequently, background effects should not be significant. However, two physicochemical aspects that amplify the importance of background SO2 and other pollutants have been identified. These are the rate and the equilibrium aspects. (See also W72-12752) (Woodard-USGS)

SCAVENGING OF SO2 BY CONVECTIVE

STORMS, Research Council of Alberta, Edmonton.

P. W. Summers. In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, spon-

sored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 305-318, December 1970. 3 fig, 3 tab, 7

Descriptors: *Air pollution, *Fallout, *Sulfides, Water pollution sources, Precipitation (Atmospheric), Data collections, Sampling, Gases, Aircraft, Rainfall, Storms, Chemical analysis, Clouds, Pollution abatement, Sulfates, Nuclea-

Identifiers: *Precipitation scavenging, Convective

During the summer of 1968, a meteorological research aircraft made 15 hr of airborne SO2 observations in central Alberta, Canada, with a continuous SO2 analyzer. On several occasions the aircraft measurements enabled estimates to be made of the air, moisture, and SO2 flux into the base of convective storms. Precipitation samples collected simultaneously by ground mobile units were analyzed for sulfate content by a conductometric titration method. Sulfur budgets for three storms indicate a high rainout efficiency in the range 0.19 to 0.65. (See also W72-12752) (Woodard-USGS) W72-12775

MECHANISMS OF IODINE INJECTION FROM

THE SEA SURFACE, Florida State Univ., Tallahassee. Dept. of Oceanography.

C. S. Martens, and R. C. Harriss

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 319-324, December 1970. 4 fig, 4 ref.

Descriptors: *Air pollution, *Iodine, *Fallout, *Water pollution sources, *Marine air masses, Aerosols, Gases, Diffusion, Vapor pressure, Temperature, Ultraviolet radiation, Sea water, Data collections, Analytical techniques, Meteorological data, Nucleation

Identifiers: Airborne particles, Sea surface in-

Experimental studies indicate that the total flux of iodine into the marine atmosphere is controlled by sea-surface temperature, ultraviolet light, and bubbling, with temperature being more important than ultraviolet light. These experiments support the hypothesis that gaseous jodine is sorbed by aerosols in the atmosphere with relative enrichment being a function of aerosol surface area. The production of gaseous iodine increased by a factor of 3 between 11 and 30 deg C owing to temperature effects alone. After multiplying artificial production by 1.67 to correct for the estimated difference from natural sunlight, gaseous-jodine production due to ultraviolet light is approximately 50% of that due to temperature effects between the range of 11 to 30 deg C. (See also W72-12752) (Woodard-USGS) W72-12776

MODEL FOR VARIATIONS WITH PARTICLE SIZE OF HALOGEN-ION RATIOS IN MARINE AEROSOLS, Michigan Univ., Ann Arbor. Dept. of Meteorology

and Oceanography.

J. A. Robbins. In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 325-351, December 1970. 11 fig, 4 tab, Descriptors: *Air pollution, *Aerosols, *Marine air masses, *Water pollution sources, *Model studies, Particle size, lodine, Bromine, Chlorine, Gases, Halogens, Chemical reactions, Mathematical studies, Analytical techniques, Vapor pres-sure, Winds, Nucleation. Identifiers: Airborne particles, Halogen-ion ratios.

A mathematical model accounts for published chemical analyses of marine aerosol size fractions for iodine, bromine, and chlorine. The model assumes that iodine vapor is gained and bromine vapor is lost by particles at rates determined by gaseous diffusion around the particle. Both iodine and bromine may saturate a particle surface layer, although the detailed mechanism of saturation is not crucial to the model. By nonlinear leastsquares fitting to observed data points, the model satisfactorily accounts for a decrease in the I/Cl ratio. The model accounts for the observed minimum in Br/Cl ratio for intermediate size fractions and the inverse dependence of its depth on wind speed. The model requires that most of the aerosol mass sampled is derived from a fairly naracross mass sampled is derived from a fairly nar-row band of particle ages in order to account for the observed composition variation with size frac-tion. This assumption provides an explanation for dependence on wind speed. Among the specific questions raised in this mathematical study are the questions raised in this mathematical study are the band width of aerosol particle ages with wind speed and sampling location, the chemistry of iodine and bromine retention by particles, and the mechanism of bromine loss from particles. (See also W72-12752) (Woodard-USGS)

THEORY OF DIFFUSIVE AND IMPACTIVE

SCAVENGING, North American Rockwell Corp., Thousand Oaks, Calif. Science Center. G. M. Hidy.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 355-371, December 1970. 8 fig, 7 tab, 9

Descriptors: *Air pollution, *Fallout, *Pollution abatement, *Rainfall, *Cloud physics, Aerosols, Gases, Particle size, Chemical reactions, Path of pollutants, Mathematical studies, Model studies, Reviews, Water pollution sources, Nucleation. Identifiers: *Precipitation scavenging, Airborne

Recent developments in a kinetic theory of hardsphere aerosols are reviewed with particular emphasis on microphysical and microchemical processes involved in scavenging of gases and par-ticles by rain clouds. Of particular interest are such topics as gas and particle diffusion to cloud and rain droplets, inertial deposition of particles on droplets, the role of rarefied gas effects in such dynamical processes, the consequences of diffusiophoretic and thermal forces acting on aerosols near water droplets, removal of gases by homogeneous chemical reactions to form aerosols chemical reactions inside and at the surface of droplets, and collision and coagulation of droplets aerosols. Elements of the idealized theory should provide a framework within which experi-ments may be interpreted or checked for consistency. Disagreement between theory and cheer vation points either to systematic experimental error or to poorly understood phenomena significant in the scavenging process. (See also W72-12752) (Woodward-USGS)

ATTACHMENT OF TRACE SUBSTANCES ON ATMOSPHERIC AEROSOLS, Texas Univ., Austin.

J. R. Brock.

Group 5B-Sources of Pollution

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 373-380, December 1970. 3 fig, 4 ref.

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Aerosols, Particle size, Model studies, Mathematical studies, Equations, Pollu-tion abatement, Nucleation.

Identifiers: *Precipitation scavenging, Airborne

A vaporous or gaseous trace substance on release into the atmosphere may undergo attachment, either directly or after some physicochemical alteration, by a variety of processes including absorption and condensation to the existent at-mospheric aerosol. The atmospheric aerosol with the attached trace substance may also undergo coagulation and thus concentrate the trace substance even more. Finally, because a single rain-drop can accrete a large number of aerosol particles, the process of precipitation scavenging can lead to still further concentration of the trace substance. Several factors are examined which lead to characteristic distributions of trace substances in atmospheric aerosols. The implications of these distributions in atmospheric cleansing processes are discussed. (See also W72-12752) (Woodard-IISGS)

RECENT CALCULATIONS OF COLLISION EF-

FICIENCIES, University Coll., London (England). Dept. of

L. M. Hocking.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Sored by Battelle Pacific Northwest Lab and U.S. Atomic Energy Comm, Div of Biology and Medicine: U.S. Atomic Energy Comm Symposium Series 22, p 381-383, December 1970. 2 ref.

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Cloud physics, *Mathematical studies, Particle size, Adhesion, Nucleation. Identifiers: *Precipitation scavenging, Colliding particles. Collision efficiencies.

Small airborne particles collide when there is an approach mechanism to bring them together and an adhesion mechanism to prevent them from being separated. Two sets of calculations for collisions are discussed: one for liquid drops and one for solid particles. The first set of calculations concerns collisions between drops of unequal size falling in still air. When the collision efficiency was greater than 0.2, low collision efficiencies differed by up to 40%. When the results are applied to changes in a cloud-droplet spectrum by collisions, the inaccuracy in the small efficiencies will not produce significant errors since the process is dominated by the most efficient collisions. The second set of calculations relates to the motions of solid particles in a shear flow. The particles are of equal size and are sufficiently small for their sedimentation rate to be negligible. (See also W72-12752) (Woodard-USGS) W72-12780

PROCESSES INFLUENCING EVOLUTION OF DROPLET OR AEROSOL SPECTRUM, National Center for Atmospheric Research,

Boulder, Colo.

R. L. Drake.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 385-402, December 1970. 45 ref.

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Aerosols, Cloud physics, Model studies, Regression analysis, Mathematical studies, Equations, Correlation analysis, Precipitation (Atmospheric), Particle size, Nucleation. Identifiers: *Precipitation scavenging, Airborne particles. Particle transport.

The state of the art of the scalar transport equation that arises in the study of an evolving size spec-trum of aerosol particles or cloud water droplets is reviewed. An integrodifferential equation contains terms accounting for coagulation or coalescence of particles, particle breakup, sedimentation of particles, particle scavenging, and droplet produc-tion due to condensation. This review includes the theoretical developments of Melzak, McLeod, and Morgenstern; the exact solutions of Golovin, Mar-tynov, Bakanov, Scott, and Drake; the numerical models of Warshaw, Berry, Friedlander, Wang, Levin, and Sedunov; and other approximate methods of Enukashvili and Golovin. Also considered are results of studies concerning the upper and lower bounds of the power moments of the particle distribution and how these results affect the choice of the collection kernel in the in-tegrodifferential equation. Ideas concerning the numerical solution of the coalescence equation by the method of perturbing the kernel and by similarity approximation are given. (See also W72-12752) (Woodard-USGS) W72-12781

PARTICLE-FREE SPACE IN STEFAN FLOW, Istituto di Fisica dell'Atmosfera, Bologna (Italy). O. A. Vittori, and V. Prodi.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 403-410, December 1970. 3 fig, 2 tab, 9

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Particle size, *Laboratory tests, Gases, Thermodynamics, Temperature, Analytical techniques, Evaporation, Diffusion, Nuclea-

Identifiers: *Particle-free space, *Stefan flow, Dust-free space, Vapor diffusion, Dark-space

In airborne particles, sources of heat or vapor bounding an aerosol are soon surrounded by a re-gion free of particles. Observed in lateral illumination, this particle-free region appears as a dark space sharply separated from the rest of the aerosol. The boundaries of the particle-free space also called dust-free or dark space) depict a condi-tion of dynamic equilibrium between particle dif-fusion and the motion caused by temperature gradient in the thermophoretic field or vapor-congradient in the thermophoretic field or vapor-con-centration gradient in Stefan flow and dif-fusiophoresis. The dust-free space around evaporating surfaces was investigated in the laboratory. A vapor-diffusion field was established in plane-to-sphere and in plane-to-plane geometries. In the plane-to-plane field, the experimental parameters can be accurately controlled. In that configuration quantitative measuretroiled. In that configuration quantitative measurements were performed on the displacement velocity of the dark-space boundary. The actual velocity was lower than the Stefan-flow velocity. This difference was interpreted in terms of Brownian diffusion of particles through the boundary. (See also W72-12752) (Woodard-USGS) W72-12782

PHORETIC PROCESSES IN SCAVENGING, Battelle-Pacific Northwest Labs., Richland, Wash.

WASh. W. G. N. Slim, and J. M. Hales. In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, spon-

sored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 411-422, December 1970. 2 fig, 18 ref. AEC Contract AT (45-1)-1830.

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Aerosols, Transportation, Cloud physics, Gases, Thermodynamics, Particle size, Mathematical studies, Latent heat, Conduction, Diffusion, Nucleation.

Identifiers: *Cloud scavenging, *Thermophoresis, Airborne particles, Particle transport.

A comparison is made of the roles played by ther-mophoresis, Brownian diffusion, and dif-fusiophoresis in the precipitation scavenging of aerosol particles. For a certain range of particle sizes thermophoresis dominates if the latent heat associated with the phase transition of water is transferred through the air to or from the precipitation element by conduction. A graph of the resulting washout coefficient shows that thermophoresis enhances the below-cloud rain scavenging of aerosol particles with radii between 0.01 and 1.0 microns. The solution is presented for the appropriate convective-diffusion equation that describes thermophoretic effects in the in-cloud scavenging problem. (See also W72-12752) (Woodard-USGS) W72-12783

PRECIPITATION SCAVENGING IN A LARGE--CLOUD DIFFUSION CODE, California Univ., Livermore. Lawrence Radiation

Lab.

K. R. Peterson, and T. V. Crawford.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 425-431, December 1970. 3 fig, 11 ref.

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Model studies, Precipitation (Atmospheric), Pollution abatement, Particle size, Clouds, Transportation, Mathematical studies,

Nucleation.
Identifiers: *Precipitation scavenging, Airboine particles, Particle transport.

In the mid-1960's a predictive model was designed for nuclear excavation experiments at the Nevada Test Site. The model was initially tested on the radioactive effluent from nuclear reactors designed for spacecraft. Since that time the code has been used for prediction and diagnosis of the three nuclear cratering tests, namely, Cabriolet (January 1968), Buggy (March 1968), and Schooner (December 1968). The model is applicable to oner (December 1968). The model is applicable to diffusion of any large cloud, not necessarily radioactive. It incorporates a precipitation scavenging option with externally specified parameters for precipitation rate and washout coefficient. The cratering test Cabriolet involved snowout downwind; predetonation predictions and later diagnostic calculations, using observed meteorological information, were compared satisfactorily with radioactivity measurements made after the Cabriolet detonation. (See also W72-12752) (Woodard-USGS)

SCAVENGING OF AEROSOLS BY RAIN: A NU-MERICAL STUDY,

IBM Scientific Center, Palo Alto, Calif. R. N. Kortzeborn, and F. F. Abraham.

In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 433-446, December 1970. 7 fig, 22 ref. Descriptors: *Air pollution, *Fallout, *Water pol-lution sources, *Model studies, Precipitation (At-mospheric), Cloud physics, Rainfall, Aerosols, Numerical analysis, Nucleation. Identifiers: *Precipitation scavenging, Airborne

particles, Particle transport.

A washout process is considered whereby small airborne particles are scavenged below the cloud level. Previously published models of washout have assumed that the raindrop size distribution and the atmospheric conditions are identical at the ground and at cloud base and do not vary with time. The mathematical model in this report allows a spatially varying atmospheric profile and takes evaporation and coalescence of raindrops into acevaporation and coatescence of raindrops into ac-count on a dynamic basis. These effects greatly alter washout at low elevations. The computa-tional model is explained in detail. (See also W72-12752) (Woodard-USGS) W72-12785

USE OF NATURAL RADIOACTIVITIES TO ESTIMATE LARGE-SCALE PRECIPITATION SCAVENGING, ESSA Research Labs., Silver Spring, Md. Air

Resources Lab.

L. Machta, R. J. List, M. E. Smith, Jr., and H.

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US and In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 465-474, December 1970. 7 fig, 22 ref.

Descriptors: *Air pollution, *Fallout, *Water pollution sources, *Argon, *Beryllium, Model studies, Transportation, Diffusion, Measurements, Atmosphere, Nucleation.
Identifiers: *Precipitation scavenging, Airborne particles, Particle transport.

Beryllium-7 and argon-37 are naturally occurring cosmogenic radionuclides with similar half-lives. Relative productions as a function of altitude and latitude are identical. Beryllium-7 is subject to precipitation scavenging; argon-37, a noble gas, is not. A one-dimensional vertical diffusion model produces surface-air concentrations to fit the few surfaces in Argon Resuprements. Sequencies is surface-air Ar-37 measurements. Scavenging is added to the diffusion model to compare predictions with the observed Be-7 vertical profile. The diffusion-scavenging model can also be tested against the distribution of Pb-210 resulting from the decay of radon gas emitted from the earth's surface. The technique promises useful information on large-scale precipitation scavenging. (See also W72-12752) (Woodard-USGS) W72-12787

SCAVENGING PREDICTION USING RATIOS OF CONCENTRATIONS IN AIR AND

PRECIPITATION,
Division of Biology and Medicine (AEC),
Washington, D.C.

Washington, D.C.
R. J. Engelmann.
In: Precipitation Scavenging (1970); Proc of Symposium, Richland, Wash, June 2-4, 1970, sponsored by Battelle Pacific Northwest Lab and U S Atomic Energy Comm, Div of Biology and Medicine: U S Atomic Energy Comm Symposium Series 22, p 475-485, December 1970. 2 fig, 20 ref.

Descriptors: *Air pollution, *Fallout, *Nucleation, *Water pollution sources, Theoretical analysis, Mathematical studies, Gases, Meteorological data, Precipitation (Atmospheric), Weather forecasting. Identifiers: *Precipitation scavenging, Airborne particles, Particle transport.

Washout ratios (factors) are applicable to the pre-diction of scavenging by precipitation of widely varying particle sizes and, perhaps, gases. The ex-

planation is compatible with observed variations of pollutant concentration in rain with rainfall rate and dew point, with the consistency of observed ratios, and with an elementary equation that is derived to explain the ratios. As cloud droplets grow by condensation on nuclei, the concentration of nuclei in the cloud droplets decreases. When droplets coalesce, the concentration remains constant. Condensation proceeds until the droplet reaches a critical size; then both condensation and coalescence proceed—in a proportion determined by the updraft speed, with strong updrafts giving a greater proportion of condensation. Precipitation rate varies directly with updraft strength. Updrafts are stronger in the more vertically developed clouds, which happen to occur more frequently in summer and in the lower latitudes. It follows that the pollutants that are scavenged as or attached to nuclei will have concentrations in precipitation that are noticeably and inversely related to precipitation rate. (See also W72-12752) (Woodard-USGS) W72-12788

FISH AND FISHERIES IN THE CONTEXT OF ENVIRONMENTAL CONCERN, Food and Agriculture Organization of the United Nations, Rome (Italy). Dept. of Fisheries. For primary bibliographic entry see Field 05C. W72.12793 W72-12793

GROUND-WATER POLLUTION IN MICHIGAN. Michigan State Geological Survey, Lansing. Dept. of Conservation. N. Billings.

Sewage and Industrial Wastes, Vol 22, No 12, p 1596-1600, December, 1950.

Descriptors: *Groundwater, *Waste disposal, *Toxicity, *Water pollution sources, Recharge, Water resources, Regulation, Time, Michigan flow, Geology.

Identifiers: *Flow direction, *Time response, Lia-

The effect of pollutant infiltration into groundwater reservoirs is discussed. Where groundwater recharge is important, waste penetration into the soil may be harmful. Examples of time responses for contaminated groundwaters are prepared for plating, picric acid, phenolic, salt, gasoline, cheese factory, and septic dry well wastes. Subsurface flows are difficult to predict. Influencing factors include hydraulic gradient, high-capacity water wells, drainage ditches, local cloudbursts, and dam construction. Major considerations with waste disposal on the ground are enumerated. They are waste toxicity, soil conditions and geological for the ground are enumerated.

gy, effect of waste on groundwater, and flow direction of waste. Pumping tests provide some criteria and help establish liability in cases of well contamination. Legal restrictions are being formulated to consider waste disposal effect on underground resourcesendangering a neighbor's wel-fare. Close regulation is needed to conserve water resources for this and future generations. (Nardozzi-AWWA) W72-12797

UNDERGROUND WASTE DISPOSAL AND

CONTROL.

American Water Works Association, New York.

Committee on Underground Waste Disposal and

Journal of the American Water Works Associa-tion, Vol 49, No 10, p 1334-1342, October, 1957. 1

Descriptors: *Waste disposal, *Underground waste disposal, Surveys, Pollutants, Geology, Hydrology, Competing uses, Water sources, Control, Path of pollutants, Time.
Identifiers: *Underground pollution, Statutory

Examples of underground pollution problems in-clude: well screen corrosion due to acid waste per-colation in an estuarine swamp; cadmium and hexavalent chromium contamination of groundwater by aircraft waste discharged to leaching pits; and by aircraft waste discharged to leaching pits; and calcium chloride contamination of downstream wells by surface discharge of this concentrated waste. A survey of U. S. underground disposal practices provided information on contaminant types, waste constituents, waste sources, and statutory control in the U. S. A tabulation is made of the nature of specific pollutants and observed distance and time of travel. A recommendation is made to group states with similar control characteristics for common studies of existing problems and determination of trends. Factors to estimate teristics for common studies of existing problems and determination of trends. Factors to estimate potential groundwater pollution are: gaging of industrial growth rate-adequacy of existent waste facilities and future needs; urban or suburban expansion developments to provide industrial growth; available water sources and comparative use of waters; general geologic and hydrologic conditions governing understand contamination. conditions governing underground contaminant movement; and knowledge of existing statutory controls. (Nardozzi-AWWA) W72-12804

ROLE OF GROUND WATER CONTAMINA-TION IN WATER MANAGEMENT, Geological Survey, Raleigh, N.C. H. E. LeGrand.

Journal of the American Water Works Association, Vol 59, No 5, p 557-565, May, 1967, 1 fig. 6

Descriptors: *Water pollution, *Groundwater, Waste disposal, Water quality.
Identifiers: *Quality deterioration, Subsurface

Groundwater contamination and its complement Groundwater contamination and its complement are placed in perspective with water development. Their importance in long-range integrated plans is demonstrated. Groundwater contamination is quality deterioration of underground supplies. These are influenced by waste disposal practices, artificial recharge of aquifers, accidents, and salt water intrusion. A major objective is to maintain each health practices and majoring disposal costs. good health practices and minimize disposal costs. Variable factors for pollution are variety of waste material, wide toxicity range, man's disposal patmaterial, wide toxicity range, man's disposal pat-terns and accidental releases, subsurface water development, elemental behavior in soil, water, and rock environment, and spatial and temporal criteria. Balanced surface and groundwater development and waste disposal policies are needed. Other considerations, and land and stream classifications are outlined. An inventory should classifications are outtined. An inventory should be compiled of type and quantity of groundwater contaminants and behavior. Work must be coordinated with specific elemental effect on biota studied. (Nardozzi-AWWA) W72-12807

DEGRADATION OF ORGANOCHLORINE IN-SECTICIDES IN FLOODED SOILS IN THE PHILLIPPINES,

International Rice Research Inst., Los Banos, Laguna (Philippines). T. F. Castro, and T. Yoshida. J. Agric Food Chem. Vol 19, No 6: p 1168-1170,

1971. Illus.

1971. IRUS. Identifiers: "Insecticides, Aldrin, Chlordane, Chlorine, DDD, DDT, "Degradation (Decomposi-tion), Dieldrin, Endrin, Heptachlor, Methox-ychlor, Philippines, Residues, Soils.

The degradation of the organochlorine insecticides DDT, DDD, methoxychlor, heptachlor, chlordane, endrin, dieldrin, and aldrin was investigated under upland and flooded conditions. DDT, DDD, methoxychlor and heptachlor degraded faster in flooded soil than in upland soil and were found to degrade faster in soils with high organic matter content. DDD was found to accumulate in DDT-treated flooded soil. Endrin was degraded only in

Group 5B-Sources of Pollution

Casiguran flooded soil. Aldrin was more persistent in flooded than in upland soil. Chlordane and diel-drin were persistent both in flooded and in upland soil.—Copyright 1972, Biological Abstracts, Inc. W72-1208

SOURCES OF SEDIMENT IN A MOUNTAIN

RIVER BASIN, Montana State Univ., Bozeman. Water Resources Research Center.

M. G. Klages.

Available from the National Technical Informaon Service as PB-211 447, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report No. 28, June, 1972, 15 p, 11 fig, 1 tab, OWRR A-041-MONT (1).

Descriptors: *Sediments, Water pollution, *Soils, *Turbidity, *Suspended solids, Measurement, *Water pollution sources, River basins, *Montana.

Turbidity measurements can be used to estimate suspended solids in water from a single watershed. The accuracy of the estimate can be improved by removing the sand and measuring it gravimetri-cally. Sediment yield is strongly influenced by geology of the drainage area. Mineralogy of the suspended material is also influenced by geology but to a lesser extent. Mineralogical measurements can be used to trace the sources of sediment where differences in geology exist within a watershed. They work best on smaller watersheds where the number of tributaries is small and distances short. They are probably best used in conjunction with other measurements such as suspended load and stream flow. X-ray diffraction patterns can be used to determine whether the major source of suspended clay in a stream is sheet erosion of weathered surface soil or erosion of unweathered subsoil and geologic materials. (Holje-Montana) W72-12817

THE ROLE OF MICROORGANISMS IN THE STABILIZATION OF SOIL AGGREGATES,

Wisconsin Univ., Madison. Dept. of Bacteriology; and Wisconsin Univ., Madison. Dept. of Soil

R. B. Aspiras, O. N. Allen, R. F. Harris, and G. Chesters.

Soil Biology and Biochemistry, Vol. 3, No. 4, p 347-353, November 1971. 4 fig, 13 ref.

Descriptors: *Binders, *Soil microorganisms, *Soil aggregates, *Soil environment, *Stability, Soil moisture, Soil microbiology, Biodegradation, Environmental effects, Nutrients. Identifiers: *Water-stable compounds

The biodegradability of chemically different soilbinding substances produced in situ by diverse microorganisms was investigated to evaluate the role of microorganisms in the promotion and destruction of soil-aggregate water-stability. Plate cultures of 7 fungi, 6 streptomycetes and 5 bacteria were grown on appropriate media for 5 days. Wet-sieve analysis was used to assess the water-stability of soil aggregates produced by pure microorganism cultures and by an indigenous soil microflora. Aggregates amended with sucrose generally showed little resistance to soil population biodegradation while aggregates amended with corn stover were more resistant, at least 60% of them being stable after 64 days. After 128 days, water-stability always deteriorated markedly, indicating that the aggregating agents were no longer being synthesized, probably because of energy source depletion. Substances synthesized at 15 degrees C were quickly biodegradable at 30 degrees C. It is felt that the status of soil aggregation is determined by the net effect of the continuous synthesis and degradation of binding materials by the microbial population en masse rather than by the activity of specific microorganisms and that this is controlled by prevailing nutritional factors and environmental conditions. (Casey-Arizona)

SUBSURFACE HYDROLOGY AT WASTE DISPOSAL SITES, IBM Watson Research Center, Yorktown Heights.

R. A. Freeze.
IBM Journal of Research and Development, Vol 16, No 2, p 117-129, March 1972. 8 fig, 2 tab, 29

Descriptors: *Waste disposal wells, *Landfills, *Water pollution sources, *Path of pollutants, *Mathematical models, Computer programs, Mixing, Unsaturated flow, Saturated flow, Waste disposal, Hydrogeology, Water pollution effects, Water coality. Water quality.

One result of concern over surface-water pollution is an increase in the popularity of ground-based waste disposal practices that save the streams but have a high potential for subsurface pollution. One of these, sanitary landfill, appears quite promising in its ability to handle large waste loads with a minimum of contamination; but two others, waste lagoons and deep-well injection of liquid wastes into geologic formations, lead to irreversible sub-surface pollution. A mathematical model of the subsurface flow can be used to predict results of disposal and to assess the impact on the environ-ment of a proposed disposal site. The model can predict transient and steady state subsurface flow systems in two or three dimensions and includes consideration of both the saturated and the unsaturated zones. It can be applied at the reconnais-sance stage on a regional basis to analyze a large number of alternative sites and at the chosen site to test the efficiency of various design alternatives and to provide guidance in the design of a monitoring system. The model predicts only convective transport and does not consider dispersion or hydrochemical reactions. (Knapp-USGS) W72-12864

SANITARY LANDFILL LEACHATE TRAVEL IN VARIOUS SOIL MEDIA-A BIBLIOGRAPHY, Vermont Univ., Burlington. Technical Informa tion Center.

W. T. Emery. Available from NTIS, Springfield, Va 22151-PB-208 095 Price \$3.00 paper copy; \$0.95 microfiche. Final Project Report, December 31, 1971. 11 p. UVM-TIC-133-71-1.

Descriptors: *Bibliographies. *Landfills. *Water Descriptors: Donographies, "Landins, "Water pollution sources, "Path of pollutants, "Lachate, Sanitary engineering, Waste disposal, Ground-water movement, Soil properties, Leaching, Sub-surface drainage, Self-purification, Documentation. Publications. Information retrieval.

A survey of literature was conducted to aid in determining how far technology had progressed in predicting the distances that sanitary landfill leachates must travel in different soil media before becoming purified to the extent that they will not contaminate sources of fresh water. The survey was conducted for the most part during the first half of calendar year 1971, with a few references added during the second half. All references (139) considered to be of value to the survey are listed in the bibliography. (Woodard-USGS) W72-12873

A REVIEW OF CONCEPTUAL MODELS AND PREDICTION EQUATIONS FOR REAERATION IN OPNE-CHANNEL FLOW.

Department of the Environment, Ottawa (Ontario). Inland Waters Branch. For primary bibliographic entry see Field 05G. W72-12878

LEAD POISONING IN COWS, Polskie Towarzystwo Nauk Weterynaryjnych, Warsaw (Poland). Z. Denz, and A. Czarnowski. Med Weter. Vol 26, No 7: p 412-413. 1970.

Identifiers: Cows, *Lead, *Feeds, Toxicity, *Su-

Mass Pb poisoning of farm animals is rare and is noted only when some source of Pb such as paint, enamel, etc. comes in contact with feed. In some cases water is the source of poisoning. In the case under consideration sugar beet pulp was the cul-prit due to mechanical damage in the sugar beet factory. Attention is called to the source in view of the universal use of sugar beet pulp in feeding cattle in Poland .-- Copyright 1972, Biological Abstracts, Inc.

AGRICULTURE AS AN ENVIRONMENTAL

FACTOR, Norges Veterinarhoegskole, Oslo. Dept. of Microbiology and Immunology.

Nor Vet Tidsskr. Vol 82, No 12: p 698-700. 1970. Identifiers: *Water pollution sources, *Agriculture, Farm wastes, Pollution abatement.

Various aspects of agricultural influence on the surrounding ecosystems are reviewed, in particu-lar the pollution with manure, ensilage liquids and liquids from lye-treating of straw, but also residuals from chemicals used in agriculture, such as antibiotics, pesticides, preservatives, and addi-tives in foodstuffs. One of the most important fu-ture tasks is considered to be the 'short-circuiting' of nutrient wastes (fertilizers, ect.), to be reused in farming instead of polluting the surroundings.--Copyright 1972, Biological Abstracts, Inc. W72-12906

SOIL CHARACTERISTICS AND SUBSURFACE SEWAGE DISPOSAL,

Department of Agriculture, Guelph (Ontario). G. J. Wall, and L. R. Webber. Can J Pub Health. Vol 61, No 1, p 47-54. 1970. Identifiers: Algae, *Sewage disposal, Drainage, Eutrophication, Ground-water, Phosphorus, Septic tanks, *Soil properties, Weeds

The discharge of P in human sewage was estimated to be 3.0 to 3.5 lb/capita yr. If 3.0 lb of soluble P were found in 100 acre-ft of water the resulting concentration would be greater than 0.01 ppm, the value at which algae blooms. Concentrations of total P greater than 0.01 ppm in groundwater are not considered normal and when this value is attained a source of contamination is suspected. Soluble P concentrations in groundwaters are vir-Soluble P concentrations in groundwaters are virtually nonexistent because of chemical fixation and precipitation as insoluble compounds of Ca, Mg, Fe and Al. In this study, 10 out of 14 samples of groundwater associated with weeping tile systems on poorly drained soils were found to constant of the control of the contr tain P in excess of the arbitrarily established con-centration of 0.01-0.02 ppm. Soils are classified as a medium for the disposal of septic tank effluents. Particular attention was paid to the depth of the watertable or bedrock, natural soil drainage, impermeable soil strata and various site features. Persons with cottage sites near a lake should be certain that the soil is suitable for disposal of septic tank effluents. Organic-free coarse sands and gravels and any soil with a watertable less than 4 to ft below the soil surface should not be considered as a sewage disposal medium.--Copyright 1972, Biological Abstracts, Inc. W72-12913

CONTENT OF CHLORORGANIC PESTICIDES IN WATER PLANTS,

Vsesoyuznyi Nauchno-Issledovatelskii Institut Giv sesoyuznyı Nauchno-Issledovatelskii İnstitut Gi-gieni i Toksikologii Pestitsidov, Kiev (USSR). K. K. Vrochinskii, I. V. Grib, and A. V. Grib. Gidrobiol Zh. Vol 6, No 6, p 107-109. 1970. Identifiers: *Pesticides, *Aquatic plants, Acorus calamus M, Chloroganic, DDT, Lemna minor M, Numphaea alba D, Potamogeton pectinatus M, Spirodela polyrriza M.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Effects of Pollution—Group 5C

The content of organic pesticides was studied in different organs of Lemna minor, Spirodela polyrrhiza, Nymphaea alba, Acorus calamus and Potamogeton pectinatus from the Stubla River, Ukrainian SSR. Pesticides were used extensively Ukrainian SSR. Pesticides were used extensively in the river basin. The greatest amount was found in N. alba (11.5 mg/kg DDT and 4.4 mg/kg hexachlorocyclohexane. In the others it varied from 3.8-2.0 mg/kg DDT and 1.16-0.94 mg/kg hexachlorocyclohexane. The amount varied according to the quantity of fatty substance in the plant, physiological characteristics which determined its level in the water and the season.—Copyright 1972, Biological Abstracts, Inc.

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ACCUMULATION AND PERSISTENCE OF DDT IN A LOTIC ECOSYSTEM,
Maine Univ., Orono. Dept. of Entomology; and
Maine Univ., Orono. Dept. of Biochemistry.
J. B. Dimond, A. S. Getchell, and J. A. Blease.
Journal of Fisheries Research Board of Canada,
Vol 28, No 12, p 1877-1882, December 1971. 3 tab,
20 ref

Descriptors: *Pesticide residues, *Lotic environment, Watersheds (Basins), *DDT, *Small watersheds, Ecosystems, Pesticide kinetics, *Maine, Muds, Invertebrates, Fish, Birds, Streams, Aquatic plants, Aquatic insects, Crustaceans, Mussels, Common merganser duck, Bioassay, Water pollution effects, Gas chromatog-

Bioassay, Water pollution effects, Gas chromatography, Brook trout, Sampling, Separation techniques, Algae, Crayfish, Food chains, Persistence, Runoff, Sediments. Identifiers: Chubs, Kingfishes, Salvelinus fontinalis, Semotilus atromaculatus, Cleanup, Sample preservation, Cambarus bartoni, Biological samples, Mergus merganser, Megaceryle alcyon, Bioaccumulation.

Small watersheds in Maine that had received various numbers od DDT treatments starting in 1958 were studied for persistence of DDT residues with adjacent untreated watersheds being used as controls. Muds, plants, invertebrates, and fish were collected in 1967 and 1968 and birds in 1969. Samcollected in 1967 and 1968 and birds in 1969. Samples were frozen within a few hours after collection and held at minus 15 C until extraction of pesticides. Various collections and extraction techniques were used, depending upon the type of sample. DDT was found to persist in the streams for at least 10 years following light application to the forest; however, residues did decline sharply after 2 - 3 years. The prolonged persistence led to cumulative levels in streams strayed more than cumulative levels in streams sprayed more than once and residue concentration throughout the food chain was evident. (Mortland-Battelle)

COMETABOLISM OF THE HERBICIDE, 2,3,6-TRICHLOROBENZOATE BY NATURAL MICROBIAL POPULATIONS, Bowling Green State Univ., Ohio. Dept. of Biolo-

R. S. Horvath.

Bulletin of Environmental Contamination and Toxicology, Vol 7, No 5, p 273-276, May 1972. 1

Descriptors: *Chlorinated hydrocarbon pesticides, *Herbicides, *Microbial degradation, *Pesticide removal, *Aquatic microorganisms, Biodegradation, Chemical reactions, Halogenated pesticides, Oxidation, Aquatic bacteria, Bactericides, Cultures, Gas chromatography, Biological treatment, Togrifite.

*Cometabolism, *2 Brevibacterium, Identifiers: Cometabonsm, -2 3 6-krichlorobenzoate, Brevibacterium, Achromobacter, Mineralization, Thin layer chro-matography, Metabolites.

The cometabolism of the herbicide, 2,3,6-trichlorobenzoate (2,3,6-TBA) by natural aquatic and terrestrial microbial populations has been studied by incubating lake water samples containing

the herbicide at ambient temperatures and determining concentrations of 2,3,6-TBA by gas chromatography. Oxidation of 2,3,6-TBA by pure cultures of Brevibacterium was shown to occur by a cometabolic process. In addition, the by-product which accumulated as a result of this oxidation, 3,5-dichlorocatechol, was also subject to cometabolic attack by a pure culture of Achromobacter. Examination of the samples from Achromobacter. Examination of the samples from three separate experiments by thin layer and gas chromatography did not reveal any chlorinated compounds other than 2,3,6-TBA, indicating complete mineralization of the herbicide by the mixed culture system. Enhancement of the rate of cometabolic oxidation of the herbicide could be achieved by addition of a biodegradable analog of 2,3,6-TBA to the cometabolic system. (Byrd-Battelle) telle) W72-12935

ANALYSIS OF TOXIC METALS IN TRADE EF-FLUENTS BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,

For primary bibliographic entry see Field 05A.

ELECTRIC POTENTIALS AND DOMESTIC WATER SUPPLIES, Washington State Univ., Pullman. For primary bibliographic entry see Field 05C. W72-12970

UPTAKE AND METABOLISM OF 2,2-BIS- (P-CHLOROPHENYL)-1,1,1-TRICHLORO
ETHANE (DDT) BY MARINE PHYTOPLANKTON AND ITS EFFECT ON GROWTH AND
CHLOROPLAST ELECTRON TRANSPORT,
Scripps Institution of Oceanography, La Jolla, For primary bibliographic entry see Field 05C. W72-12998

THE INFLUENCE OF INCREASED NITROGEN FERTILIZATION ON THE NITRATE CONTENT OF GROUND WATER.

Z Gesamte Hyg Grenzgeb. Vol 17, No 8, p 588-

John Holdentifiers: *Water pollution sources, Water pollution effects, *Fertilization, Groundwater, Infants, Nitrates, Nitrogen, Methemoglobinemia.

Nitrate-containing water was found to be the cause of methemoglobinemia in infants. Because cause of methemoglobnemia in infants. Because of this, chemical testing of drinking water was carried out for many years. A statistical study is now reported showing that there was a significant increase in nitrate from 11.33 mg NO3/1 in 1926 to 17.89 mg/l in 1962. During the same period the use of nitrogen fertilizer increased from 10 to 40 kg/hectare,—Copyright 1972, Biological Abstracts, Inc. W72-13005

EFFECT OF URBAN AND AGRICULTURAL PESTICIDE USE ON RESIDUE LEVELS IN THE RED CEDAR RIVER, Michigan State Univ., East Lansing. Dept. of En-

M. J. Zabik, B. E. Pape, and J. W. Bedford. Pestic Monit J. Vol 5, No 3, p 301-308. 1971. Illus.

Map. Map. Identifiers: *Water pollution sources, Agriculture, Michigan, *Pesticides, Red Cedar River, Residues, Rivers, Seasonal, Variations, Cities.

Analyses on 1549 water and bottom samples have shown high levels of DDT and its metabolites (TDE and DDE) in the Red Cedar River. The river becomes progressively more contaminated in a downstream direction and shows seasonal varia-tions. The concentrations of pesticides in bottom samples give a good indication of long term contamination, whereas levels in the suspended matter (that retained by a 5-micron filter) indicate the amount of pesticide being carried on a short term basis. The largest amount of pesticide contamination entering the Red Cedar River comes from the waste water treatment plants.--Copyright 1972, Biological Abstracts, Inc. W72-13007

RESIDUE LEVELS OF DIELDRIN IN AQUATIC INVERTEBRATES AND EFFECT OF PROLONGED EXPOSURE ON POPULATIONS, Georgia Univ., Athens. Coll. of Agricultural Experiment Stations.
For primary bibliographic entry see Field 05C. W72-13014

5C. Effects of Pollution

EFFECT OF SPECTRAL COMPOSITION ON PHOTOSYNTHESIS IN TURBID RESERVOIRS...PHOTOSYNTHETIC PRODUCTION IN A TURBID RESERVOIR II. DETAILS OF AN INCUBATION MODEL AND COMMENTS ON THE EFFECT OF LIGHT QUALITY ON PHOTOSYNTHESIS, Kansas Water Resources Research Inst., Manhat-

J. A. Osborne, and G. R. Marzolf. Available from the National Technical Informa-tion Service as PB-211 368, \$3.00 in paper copy, \$0.95 in microfiche. Contribution No 106, June 1972. 102 p, 8 fig, 11 tab, 69 ref, 2 append. OWRR A-047-KAN (1).

Descriptors: *Reservoirs, *Primary productivity, *Turbidity, *Photosynthesis, Limnology, *Eutrophication, *Kansas, Model Ecosystems, Algae, *Light quality, Eutrophic zone, Chlorophyll, Phosphates, Nitrates, Seasonal, Regression analysis, Correlation analy-

Identifiers: *Photosynthetic model, *Tuttle Creek Reservoir (Kan), Great Plains, Aquatic ecosystem.

A numerical model, based on some simplifying assumptions, was used to evaluate spatial and seasonal patterns in primary production in Tuttle Creek Reservoir, Kansas, from June 1970 through May 1971. The assumptions of the model best fit turbid, homothermal lakes, such as those in Kan-sas and the Great Plains Province. The model describes the photosynthesis-depth profile on the basis of light attenuation with depth and allows inbasis of light attenuation with depth and allows in-tegral photosynthesis to be obtained by a simple analytical calculation. The use of the model had its greatest advantage in allowing pelagic algal photosynthesis to be monitored in shipboard incu-bators. Various chemical, physical, and biological features were measured simultaneously with pri-mary production to describe the diversity of the reservoir, to evaluate horizontal production patterns, and to validate the assumptions of the model. W72-12393

OIL SLICKS AND FILMS.

Defense Documentation Center, Alexandria, Va. For primary bibliographic entry see Field 05B.

HEATED WATER IN AQUICULTURE,

Oregon State Univ., Newport. Dept. of Fisheries and Wildlife. W. J. McNeil.

In: Transactions of the Thermal Effluent Informa-tion Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho,

Group 5C-Effects of Pollution

Descriptors: *Beneficial use, *Heated water, *Aquiculture, *Thermal powerplants, Cooling water, Fish farming, Salmon, Catfishes, Commercial fish, Shellfish, Oysters, Pacific Northwest U.S. *Thermal pollusions. U.S., *Thermal pollution.

A typical one million kilowatt nuclear plant might A typical once minor known tructers paint might pump 700,000 gallons of cooling water per minute. The temperature of the cooling water would rise about 15 F. Developing satellite fish farms at steam electric stations as an alternative to heating our rivers is being explored in the United States. Heated water provides a sheltered nursery for young oysters on Long Island Sound. The use of heated water might extend the ground. catfish into winter and allow production in northern latitudes. Fish raised in systems where temperature and ration can be controlled grow more rapidly and are more efficient at converting food stuffs to edible muscle than are farm animals. Problems with using heated effluent in fish farming include scheduling shutdowns of power plants. controlling the concentration of chemicals in condenser water, and elimination of radioactive wastes from supply water. Development of a successful aquiculture industry at steam-electric stations requires close liason between the fish farmer and the electric utility. (See also W72-12466) (Eagle-Vanderbilt) W72-12469

THERMAL POLLUTION AND THE AQUATIC ENVIRONMENT, Idaho Dept. of Fish and Game, Boise.

M Richards

In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho,

Descriptors: *Heated water, *Fish conservation, *Fish, Competition, Reproduction, Fish populations, Growth rates, Temperature, Electric power-plants, Water pollution effects, *Thermal pollution.

To a large extent, water temperature determines the species of fish that are present in any given body of water and the degree of success compet-ing species will have in maintaining their individual populations. Reproductive processes, growth, oxygen consumption, activity and even ability to stay alive are affected by temperature. Unexpected results which have occurred from alteration of temperature regimens are cited. Measures to eliminate and forestall thermal pollution problems must be taken if waters are to be used for industrial purposes and a desirable aquatic environment is still to be maintained. (See also W72-12466) (Eagle-Vander W72-12471 anderbilt)

MICROBIAL DEGRADATION OF DDT
METABOLITES TO CARBON DIOXIDE,
WATER, AND CHLORIDE,
California Univ., Riverside. Dept. of Soil Science
and Agricultural Engineering.
For primary bibliographic entry see Field 05B.

W72-12484

INITIAL STUDIES ON THE MICROBIAL BREAKDOWN OF TRIALLATE. Saskatchewan Univ., S, Regina, Dept. of Biology. For primary bibliographic entry see Field 05B.

DEGRADATION N-ALKANE-1-SULFONATES BY PSEUDOMONAS, Amsterdam Koninklijke/Shell-Laboratorium. (Netherlands). For primary bibliographic entry see Field 05B.

CATIONIC UPTAKE AND EXCHANGE IN SAL-

MONELLA ENTERITIDIS, Georgia Univ., Experiment. Div. of Food Science. For primary bibliographic entry see Field 05B.

EFFECT OF TYPE OF ENRICHMENT AND DU-RATION OF INCUBATION ON SALMONELLA RECOVERY FROM MEAT-AND-BONE MEAL. Agricultural Research Service, Philadelphia, Pa. Marketing and Nutrition Research Div. C. N. Huhtanen, and J. Naghski. Applied Microbiology, Vol. 23, No. 3, p 578-585,

March 1972. 6 tab, 18 ref.

Descriptors: *Salmonella, *Incubation, *Enteric bacteria, Cultures, Statistical methods, Fluorescence, Pollutant identification, Resistance, Enzymes, Environmental effects, Bioindicators. Identifiers: *Enrichment, Antiserums, Biological samples, Sample preparation, Agglutination, Culture media, Substrate utilization, Selective media, Serotypes, Meat, Bone, Biochemical tests.

Twenty-five meat-and-bone meal samples were enriched with either selenite-cystine or tetrathionate and incubated for 1 and 2 days. Seven were previously found to be positive; of the other 18, 16 were positive for Salmonella. The number of somatic serogroups per sample ranged from 1 to 11 with a mean of 3.8. Significantly more (P less than 0.01) group C sub I salmonellae were isolated using tetrathionate than selenite, whereas significantly more of groups G, 35, and Difco polyvalent D were isolated from selenite than tetrathionate. Seventy-six percent of the presumptive colonies from Brilliant Green agar showed a positive lysine decarboxylase reaction, and there were no differences between media or times of incubation. Ninety-four per cent of the lysine decarboxylase-positive cultures showed a positive somatic antiserum response; again there were no differences between times or enrichments although there were significantly more total positive serogroups at 2 days than at 1 day from tetrathionate but not from selenite. There were indications that certain serogroups preferred either one or the other enrichment. There were no differences in total positive samples with the two enrichments although neither alone was sufficient to identify all positives. Several lactose-positive sal-monellae were recovered. (Mortland-Battelle) W72-12494

BLOOD COMPOSITION OF THE NINESPINE STICKLEBACK (PUNGITIUS PUNGITIUS) UNDER UNFAVORABLE OXYGEN CONDI-TIONS, L. D. Zhiteneva.

Vopr Ikhtio. Vol 11, No 3:, p 509-517, 1971. Illus. Identifiers: *Adaptability, *Oxygen sag, Blood, Oxygen, *Pungitius pungitius, Sticklebacks.

Studies were conducted on the adaptability of ninespine strickleback (Pungitius pungitius) when transferred to Promernoe Lake (Murmansk region), which has a low O2 concentration (0.8-0.9 m1/l. The investigations were conducted from June 1967 to April 1968, with 46 blood smears obtained from 46 specimens. The results showed that at the beginning of winter under conditions of O2 insufficiency erythrocytes are released into the circulation from spleen depots when the O2 deficit is of 1.5-2 mo. duration. Prolonged O2 insufficiency (4.5-5 mo. duration) results in anemia and increased erythropoiesis. The percentage of immature red cells and of phagocytic white cells increased. After 5 mo. in a state of O2 insufficiency the erythropoietic organs were exhausted and this was reflected in erythrocyte polymorphism.— Copyright 1972, Biological Abstracts, Inc. W72-12542

INTERRELATIONS AMONG PLANKTON, ATTACHED ALGAE, AND THE PHOSPHORUS CYCLE IN ARTIFICIAL OPEN SYSTEMS, Ithaca Coll., N.Y. Dept. of Biology.

J. L. Confer. Ecological Monographs, Vol 42, No 1, p 1-22, 1972. 10 fig, 9 tab, 32 ref.

Descriptors: *Plankton, *Algae, *Phosphorus, *Model studies, Lakes, Cycling nutrients, Tracers, Littoral, Kinetics, Phosphates. Identifiers: *Phosphorus circulation, Small lakes.

Phosphorus circulation during summer stratification was studied in 200-liter aquaria, continuously supplied with tap water, by means of analytical and tracer methods. This model of phosphorus circulation is believed to apply to small lakes with extensive littoral vegetation, the phosphorus influx to various biological compartments being equaled by a corresponding outflow. A major means by which phosphorus was removed from the open water was by trapping of particles by the commu-nity associated with the aquaria sides. After the first run the ponds were inoculated with water from the previous ponds. A biotic succession developed from a purely planktonic community to a more complex, two-community system of at-tached organisms on the sides and the plankton. The P removal rate varied widely, depending on extent of 'littoral' growth and nature of the particles. Considering succession to be the total change in physical and biological conditions over prolonged time, this open-system design developed from a one-community, few-species system into a two-community, several-species system. Nutrient circulation rate greatly increased with time and developed into this steady state, not an equilibrium system which depended on a continual phosphorus influx to maintain concentrations and circulation rates. (Jones-Wisconsin) W72-12543

NUTRIENTS LIMITING ALGAL GROWTH, DSM's Central Lab., Geleen (Netherlands). Biological Dept. Strikstof, Dutch Nitrogenous Fertilizer Review, No 15, p 16-27, 1972. 3 fig. 12 photos, 26 ref.

Descriptors: *Eutrophication, *Nutrients, *Algae, *Limiting factors, Phosphates, Chlorophyta, Cyanophyta, Nitrogen, Carbon, Diatoms, Bacteria, Carbon dioxide, Chlamydomonas, Scenedesmus, Chlorella, Silica, Light intensity, Temperature, Mud, Growth rates, Anabaena,

Nitrogen fixation, Denitrification, Water pollution effects, Water pollution control. Identifiers: Netherlands, Limiting nutrients.

Literature on excessive algal growth is reviewed. Although limnologists argue that algal growth is generally limited by phosphorus, nitrogen can also be limiting in some cases; it is also argued that carbon, not phosphorus, is the limiting nutrient. If a correlation is found between phosphorus concentration and algal yield, it is not proper to conclude that phosphorus is the limiting nutrient. It will take a considerable time before any effect of phosphate removal is observed, considering the vast quantities of phosphates stored in the mud. Microbial processes in toto probably have a regulating effect on nitrogen concentration of surface waters. It is unlikely that carbon would be the limiting element in view of high bicarbonate content of most waters. Whether bicarbonates or carbon dioxide are utilized by algal populations is discussed. Literature concerning the influence of N, P and C on algal growth in surface waters does not indicate clearly which element has limiting effect under the prevailing Netherland conditions. All forms of pollution by heat, chemicals, pathogenic microorgan-isms, etc., must be diminished if the water is to continue to support life. (Jones-Wisconsin) THE EUTROPHICATION OF SURFACE WATER BY AGRICULTURE AND THE URBAN POPULATION, Institute for Soil Fertility, Haren-Groningen (Netherlands).

G. J. Kolenbrander. Strikstof, Dutch Nitrogenous Fertilizer Review, No 15, p 56-67, 1972. 2 fig, 5 tab, 28 ref, 4 photos.

Descriptors: *Eutrophication, *Surface waters, *Agriculture, Urbanization, Leaching, Phosphates, Runoff, Soil types, Grassland, Arable land, Domestic wastes, Detergents, Drainage, Denitrification, Ammonia, Farm wastes, Fertilizers, Nitrogen. Identifiers: *The Netherlands.

Nutrients and the sources from which they originate were studied. Comparison was made between the contribution of nitrogen and phosphorus through the soil and main drainage to Dutch surface waters. Lysimeter investigations and river-water analyses are in reasonable agree-ment regarding losses of phosphate and nitrogen from cropland. Nitrogen leaching depends on soil type, nature of crop, and amount and timing of fer-tilizer application. Leaching of phosphate seems little affected by fertilizers due to high P-fixing soil capacity. Contribution of urban populations to eutrophication by phosphate is considerably greater than that of the soil. Townspeople release 33 million kg/year phosphate while a 2.2 million hectare cropland contributes about 3.5 million kg/year. The nitrogen contribution from townspeople is 48 million kg/year; from farmers 70 million kg/year. Half of the phosphate contribution from townspeople originates from detergents. In recent decades agriculture has contributed to eutrophication only by increasing volume of farmyard manure applied in winter. Most nitrogen comes from arable land, which has decreased sharply, thus increase in nitrogen eutrophication is probably not significant. Contribution of phosphate has not significantly increased. Any reduction of N and P would be at the expense of soil fertility. Only chemical purification of effluent can reduce the phosphate burden of surface water appreciably. (Jones-Wisconsin) W72-12545

EFFECT OF BENTHAL DEPOSITS ON OXYGEN AND NUTRIENT ECONOMY OF FLOWING WATERS,

New York Univ., Bronx. Dept. of Civil Engineer-

J. Fillos, and H. Molof.

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Journal Water Pollution Control Federation, Vol 44, No 4, p 644-662, 1972. 15 fig, 2 tab, 27 ref. 521-

Descriptors: *Bottom sediments, *Oxygen, *Nutrients, Decomposing organic matter, Aerobic conditions, Anaerobic conditions, Oxygen demand, Mud-water interfaces, Laboratory tests, Model studies, Biochemical oxygen demand, Chemical oxygen demand, Dissolved oxygen, Phosphates, Ammonia. Identifiers: Benthal deposits, Oxygen uptake.

Mechanism of benthal decomposition and its effect on the overlying water quality were studied with a continuous-flow model. This approach to benthal deposit study has the advantages of enabling the investigator to test different parame ters under steady-state conditions and of being a fairly simple system to define mathematically. It permits calculation of oxygen uptake rate and BOD release along with other parameters. Benthal decomposition of sludge bottoms involves both aerobic and anaerobic processes. Aerobic activi-ties are restricted to the mud surface a few millimeters deep. Anaerobic decomposition is active within the remainder of the sludge depth and becomes more significant in benthal stabilization as the depth increases. Oxygen uptake rate of benthal deposits is relatively independent of sludge depths for depths greater than about 4 inches. In addition to the oxygen demand of benthal deposits, the BOD and COD releases are also important parameters. The release of nutrients, phosphate and ammonia, from benthal deposits increases appreciably when the DO falls below 1.5 mg/l. A dual DO standard is needed both for the bulk of surface and for the bottom of the natural water body. (Jones-Wisconsin) W72-12546

THE DETERMINATION OF MINERALIZATION LOSSES IN CORRELATION WITH THE ESTI-MATION OF NET PRIMARY PRODUCTION WITH THE OXYGEN METHOD AND CHEMI-CAL INHIBITORS, Hydrobiologisch Institutt, Nieuwersluis (Nether-

H. L. Golterman. Freshwater Biology, Vol 1, p 249-256, 1971. 1 tab,

Descriptors: *Measurement, *Primary productivity, *Oxygen, *Chemistry, *Inhibitors, Eutrophication, Carbon, Nitrogen, Temperature, Bacteria, Respiration, Photosynthesis, Laboratory tests. Identifiers: *Mineralization losses, Lake George

Calculation of net primary production using the light-dark bottle technique for which the oxygen uptake in darkness is subtracted from gross oxygen production under illumination is based on two assumptions: the overnight oxygen consumption is due only to algal respiration or mineralization of algal material by bacteria-and should therefore be subtracted from the algal material produced during day time, and oxygen consump-tion in the light and dark bottles is the same. This study determined whether specific bio-chemical inhibitors may be used to test the assumptions. In eutrophic lake water samples, incubated with dinitrophenol, decrease of particulate-carbon was about equal to decrease of particulate-nitrogen and was lower than the simultaneous oxygen consump-tion. This suggests that mineralization of the par-ticulate material is caused by a bacterial process and not only by respiration. Therefore, only part of the oxygen consumption in darkness should be subtracted from the net algal production in light to estimate net daily production. It could be demonstrated with samples incubated with DCMU that oxygen consumption in light bottles is larger than in dark bottles. Both effects increase the results of the daily primary production from field observa-tions. (Jones-Wisconsin) W72-12547

INTERNATIONAL SYMPOSIUM ON WATER POLLUTION CONTROL IN COLD CLIMATES. Alaska Univ., College. Inst. of Water Resources.

Copy available from GPO Sup Doc EP 2.10: 16100EXH 11/71, \$2.50; microfiche from NTIS as PB-211 316, \$0.95. Papers presented at Symposium at University of Alaska, College, July 22-24, 1970. Environmental Protection Agency Water Pollution Control Research Series, November 1971. 332 p. EPA Program 16100 EXH 11/71.

Descriptors: *Cold regions, *Water pollution control, *Wastewater treatment, *Water pollution effects, Water pollution, Water pollution sources, Alaska, Biological treatment, *Lakes.

An international symposium on water pollution control in cold climates was sponsored by the Alaska Institute of Water Resources and the Federal Water Quality Administration in July 1970. Invited papers discussed waste treatment technology and effects of wastes upon Far Northern receiving waters (see W72-12549 thru W72-12566). SYNOPTIC STUDY OF ACCELERATED EUTROPHICATION IN LAKE TAHOE-AN AL-

PINE LAKE,
California Univ., Davis. Inst. of Ecology.
C. R. Goldman, G. Moshiri, and E. de Amezaga.
In: International Symposium on Water Pollution
Control in Cold Climates, July 22-24, 1970,
University of Alaska, College, p 1-21. 9 fig, 2 tab,

Descriptors: *Eutrophication, *Lakes, *Alpine, *Synoptic analysis, Cold regions, Nutrients, Biological communities, Algae, Periphyton, Phytoplankton, Photosynthesis, Invertebrates, Biomass, Benthic fauna, Benthic flora, Human population, Primary productivity, Water chemistry, *California, *Nevada. Identifiers: *Lake Tahoe (Calif-Nev).

Lake Tahoe was studied by the synoptic approach which provides a nearly instantaneous evaluation of conditions existing on a given day, allowing nutrient sources to be located accurately. In-creased fertility was evident at the South Shore under the influence of the Truckee River and high under the intucer of the Tucker kiver and nigh resident population, in Crystal Bay which con-tained highly disturbed land drainage, and near the lake outflow where there were high resident popu-lation and fairly extensive shallow water areas. Although occasional high periphyton values were encountered near tributaries, there was less cor-relation with tributaries than was found for relation with indicates that was found to phytoplankton productivity and biomass; distribution of periphyton was fairly uniform around the lake. The abundance and diversity of benthic organisms may not be functions of the same environmental property as the abundance, productivity, and diversity of the phytoplankton. The primary producers must be viewed as a more sensitive indication of increased fertility than chemical parameters, since any additional nutrients appear to move rapidly into the phytoplankton. Little or no measurable change in water chemistry was found while phytoplankton photosynthesis showed a very significant change. (See also W72-12548) (Jones-Wisconsin)

THE SOUTH BASIN OF LAKE WINNIPEG - AN ASSESSMENT OF POLLUTION,
Department of Mines and Natural Resources,

Department of Mines and Natural Resources, Winnipeg (Manitoba). Fisheries Branch. J. M. E. Crowe. In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 22-47. 4 fig, 5 tab, 95 sec. 2 are 2 fig. 5 tab. 95 ref, 2 append.

Descriptors: *Water pollution, *Benthos, *Chemical analysis, Lakes, Limnology, Water pollution effects, Biological communities, Water pollution sources, Diptera, Fish, Cold regions, Gastropods, Mayflies, Amphipoda, Nematodes, Oligochaetes, Standing crops, Commercial fish, Mercury. Identifiers: *Lake Winnipeg (Manitoba), *South

That Lake Winnipeg is undergoing a eutrophica-tion cycle similar to Lake Erie is illustrated by changes that have occurred in the benthic fauna changes that have occurred in the benthic rauna since 1930, standing crop and composition, chemical composition of the water, and reduced commercial fish production. Surveys on the south basin were conducted twice yearly, between March 1962 and September 1969, to determine changes attributable to pollution. The only ionic composition of the production component showing an increase since 1930 is calci-um. Mean concentrations of calcium, iron, sulphate, and total solids were higher in 1960 than in 1930. Maximum levels for most chemical com-ponents were recorded in 1966 and 1967, corresponding to high water levels; the lack of any significant increases in concentrations is believed to be due to low residence time and effective flushing. Benthic densities have increased from 437 and 578/sq m to 776/sq m during the 1962-1969

Group 5C-Effects of Pollution

period. Benthos composition shifted from that dominated by Amphipoda and Ephemeroptera to the present Chironomidae-Oligochaeta configuration. Approximately 39% of all chironomids and 95% of all oligochaetes, between 1962 and 1969, were composed of pollutional species. As enrichment proceeds, benthos in Lake Winnipeg's south basin will ultimately be dominated by oligochaetes. (See also W72-12548) (Jones-Wisconsin) W72-12560

EUTROPHICATION IN SOME LAKES AND COASTAL AREAS IN FINLAND, WITH SPECIAL REFERENCE TO POLYHUMIC LAKES, Helsinki Univ. (Finland). Dept. of Limnology. P. O. Lehmusluoto.

In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 48-60. 6 fig, 6 tab, 31 ref.

Descriptors: *Eutrophication, *Lakes, *Fjords, Phytoplankton, Primary production, Light penetration, Cold regions, Humus, Organic matter, Turbidity, Diatoms, Trophic level, Nitrogen, Phosphorus, Water pollution sources, Coasts, Nutrients, Domestic wastes, Pulp wastes, Sea water, Solar radiation, Temperature.

Identifiers: *Finland, Polyhumic lakes, Lake Saimaa (Finland), Lake Hakojarvi, Limiting nutrients, Coastal waters.

Finnish polyhumic lakes with their fast melting ice cover, short growing season, and great seasonal light variations are discussed with relation to these effects on primary production. It is suggested that the mean maximum primary production rate per unit volume in the water column during the growing season be measured in situ, or in constant light, and used as an index for many kinds of water bodies to give a relative but objective index of the phototrophic level. It would not reflect the total amount of organic material built up in the whole water column (which can be estimated by the light extinction curve), but it may be informative about the degree of eutrophication. Experiments showing the role of nitrogen and phosphorus in the eutrophication process in Lake Hakojarvi indicated that nitrogen was the primary limiting nutrient. Some data on eutrophicative effects of domestic sewage and pulp mill effluents, typical pollutants in Finland, are presented from Lake Saimaa and two coastal areas. Experimental results of one of the fjord systems are given briefly. Annual primary production in the inner-most bay was over five times higher than in the unpolluted areas in the Gulf of Finland. (See also W72-12548) (Jones-Wisconsin) W72-12551

THE RECOVERY PROCESS OF A LAKE WHICH RECEIVED WASTEWATER FROM AN ORE DRESSING PLANT, Swedish Water and Air Pollution Research Lab..

Swedish Water and Air Pollution Research Lab., Stockholm.

B. Ahling.
In: International Symposium on Water Pollution
Control in Cold Climates, July 22-24, 1970,
University of Alaska, College, p 61-70.11 fig.

Descriptors: "Self-purification, *Lakes, *Pollution abatement, Water pollution control, Physicochemical properties, Industrial wastes, Color, Turbidity, Hydrogen ion concentration, Conductivity, Iron, Oxygen, Biota, Aquatic life. Identifiers: "Ore dressing plant, "Balsjon (Sweden).

Lake Bal (Balsjon), Sweden had been receiving waste water from a dressing plant for magnetite and hematite which closed in 1967. For two years before the plant closing, Balsjon and a similar lake, as control, were investigated to develop comparative material with which to study the lake's

recovery. The water had been so turbid that the Secchi disk transparency was reduced to only a few centimeters. The first part of the recovery stage was reached in 1970 and was concerned chiefly with the physico-chemical factors and was a relatively simple process-mainly a question of sedimentation rates. The important problem is how rapidly the embankments of waste along the shores can be bound by vegetation for the prevention of inorganic matter being washed into the lake by rain and melt water. The second stage is chiefly development of a balanced biosystem, and is difficult to foretell. Results show that the number of species in the system in on the increase; certain species begin to become predominant with a mass development. Presumably this tendency will continue until an organic layer has been formed above the inorganic sediment which is essential to give the different organisms protection against predacity and thus reduce fluctuations. (See also W72-12548) (Jones-Wisconsin) W72-12548 (Jones-Wisconsin)

DEPLETION OF OXYGEN BY MICROORGAN-ISMS IN ALASKAN RIVERS AT LOW TEM-PERATURES,

Federal Water Pollution Control Administration, College, Alaska. Water Lab.

In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 71-95. 14 fig, 4 tab. 41 ref.

Descriptors: *Ice cover, *Alaska, *Rivers, *Dissolved oxygen, *Bacteria, Metabolism, Cold regions, Temperature, Growth rates, Nitrogen, Carbon, Phosphorus, Sewage treatment, Cycling nutrients, Pseudomonas.

Identifiers: *Oxygen depletion, Psychrophilic bacteria.

The aquatic biota of Alaskan rivers survives ex-treme fluctuations of dissolved oxygen throughout the year. Problems arise when oxidizable domestic or industrial wastes enter these rivers. Psychrophiles (bacteria that grow well at zero centigrade within two weeks) are important in cycling of matter. A pure culture study of psychrophilic bacteria isolated from a subarctic river suggested that domestic pollution caused a change in population composition. Effect of added organic and inorganic nutrients and incubation temperature on rate and extent of dissolved oxygen depletion was investigated. In studying effect of sewage treatment plant effluents on DO depletion in unpolluted subarctic river water, the bacterial population in the river water appeared to have some effect on the extent of DO depletion at 10 and 20C since the rate and extent of depletion was increased when the effluent was incubated in river water. There are general similarities between arctic and subarctic rivers but more study is necessary to define the effects of pollutants on arctic rivers. Results showed that incubation temperature and diluent had an effect on DO depletion with sewage treatment plant effluents; therefore the receiving water should be used as the diluent and the incubation temperature should be at or near the temperature of the receiving water. (See also W72-12548) (Jones-Wisconsin) W72-12553

PREDICTION OF DISSOLVED OXYGEN LEVELS IN THE SOUTH SASKATCHEWAN RIVER IN WINTER,

New Brunswick Univ., Fredericton. Dept. of Civil Engineering. R. C. Landine.

In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 96-111. 5 fig, 3 tab. 20 ref.

Descriptors: *Dissolved oxygen, *Rivers, *Ice cover, *Model studies, Cold regions, Waste water

(Pollution), Biochemical oxygen demand, Computer programs, Winter. Identifiers: *South Saskatchewan River.

The most critical DO levels, important parameters for measuring river pollution, are experienced in winter. Better methods are needed for predicting DO levels under ice conditions. An investigation was made into DO levels of a prairie river, South Saskatchewan River, in winter. Models were developed from basic considerations, checked against field observations, and modified to reproduce existing situations. Theoretically, the model could be used to predict what would happen to the DO profile if certain changes, such as river flow and waste loading, occurred. The important factors considered in developing the equations to calculate the DO profile are discussed. Considering the basic forces of oxygen supply and demand, it was possible to write a series of DO equations which satisfactorily represented the oxygen balance. The magnitude of the first-order deoxygenation rate constant was not critical in evaluating DO levels when the biochemical oxygen demand of the waste water loadings at zero centigrade was known. The results illustrated that reaeration, in open water reaches and at weirs, is very beneficial in the oxygen economy under winter ice cover. (See also W72-12548) (Jones-Wisconsin)

POLLUTION - A BIOLOGICAL STUDY OF SOME RECEIVING WATERS IN HOKKAIDO, Nara Women's Univ. (Japan). Zoological Inst. M. Tsuda, T. Watanabe, and K. Tani. In: International Symposium on Water Pollution

In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 113-124. 2 fig, 4 tab, 5 ref.

Descriptors: *Rivers, *Water pollution effects, *Biota, Industrial wastes, Water quality, Coal mine wastes, Benthic flora, Sewage effluents, Benthic fauna, Water pollution sources, Pulp wastes, Coal mine wastes, Silts. Identifiers: *Ishikari River (Japan).

P. II LS S. J. Li C U ta

The Ishikari River, Japan, receives wastes from manufacturing industries, a pulp mill, and coal mines. Discoloration of the water results and its bed is covered by coal mines silt. Temperature, pH, and transparency of the water at the stations studied are recorded. Sewage treatment effluent and other sewage of the City of Sapporo and industrial wastes are discharged into a tributary. Records of flora and fauna at the sampling stations and their relation to the various sources of pollution are given. Two kinds of effects on the biological water quality must be considered: that of organic pollution from municipal sewage and paper or pulp mills and that of silt from coal mines. Pollution by the pulp and paper mills is the most serious. The dissolved organic materials from the peat zone and the low water temperature in most months of the year are the reasons why the brown water color and high COD value hold in the whole middle and lower course of the river. The suspended silt and sand on the river bed roll downstream resulting in an unstable bottom which hampers development of benthic microorganisms, including bacteria, indicating reduced potentiality of natural river purification. (ee also W72-12548) (Jones-Wisconsin) W72-12555

CHEMICAL EFFECTS OF SALMON DECOM-POSITION ON AQUATIC ECOSYSTEMS, Alaska Univ., College. Inst. of Marine Science. D. C. Brickell, and J. J. Goering.

D. C. Brickell, and J. J. Goering.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 125-138. 7 fig, 3 tab, 8 ref.

Descriptors: *Sea water, *Chemical properties, *Decomposing organic matter, *Salmon, Bays, Water pollution sources, Estuaries, Freshwater, *Alaska, Nitrogen, Ammonia, Organic matter, Toxicity, Commercial fishing, Spawning, Intertidal areas, Streams.

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tidal areas, streams. Identifiers: "Sea food processing wastes, Lliuliuk Bay (Alaska), Sashin Creek (Alaska), Little Port Walter (Alaska), Bering Sea, Amaknak Island (Alaska), Unalaska Island (Alaska).

Initial investigations are presented on the effects of salmon carcass decomposition and sea food processing wastes on the nitrogen chemistry of the water in which the decomposition occurs, the form and distribution of the organic matter which is returned to the marine system, and the rate at which remineralization occurs. Observed ammonium and dissolved organic nitrogen concentrations indicate that decomposing salmon carcasses influence stream chemistry significantly. Survival of salmon eggs was considerably lower in the lower stream reaches. The chemical parameter normally ssociated with egg survival in the spawning bed is associated with egg survival in the spawing beth is dissolved oxygen, but ammonium or other carcass decomposition products significantly influence egg survival. Large dissolved organic nitrogen concentrations in surface waters of Little Port Walter undoubtedly reflect salmon carcass decomposition in the stream and in the intertidal zone. Estuary bottom received most of the carcasses where final decomposition occurs. Sediment samples of Little Port Walter estuary bottom showed a gelatinous quality even when taken prior to the deposition of the fish, suggesting that sediment may act as a nutrient sink. This gelatinous composition probably results from long term accumulation of fish carcasses. All sediment samples from Toledo Harbor (the control area) were granular. (See also W72-12548) (Jones-Wisconsin) W72-12556

PHOSPHORUS BINDING MECHANISMS DUR-ING SELF-PURIFICATION OF POLLUTED

LAKES, Swedish Water and Air Pollution Research Lab., Stockholm.

J. Werner. In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 139-152. 9 fig, 4

Descriptors: *Chemical reactions, *Self-purification, *Lakes, *Sediments, *Iron compounds, Eutrophication, Alkalinity, Oxygen, Hydrogen ion concentration, Carbon dioxide, Carbon, Aerobic conditions, Stratification, Hypolimnion, Ice cover, Phosphates, Primary productivity, Alu-minum, Oxydation-reduction potential, Sulfides. Identifiers: *Phosphate binding, Ferric iron, Hydrogen carbonate.

The theory discussed illustrates that in order to enhance the capacity of the sediments to act as a sink for phosphorus, advantage could be taken of the fact that the binding of phosphate to ferric iron and to aluminum will increase in stability when the pH is lowered. Supplemental experiments are described where the reactions of a sediment system to changes in hydrogen carbonate concentration and pH were examined in sediments and water from the hypertrophic Lake Lillsjon, Sweden. In accordance with theory, the osphorus concentration shows the largest drop phosphorus concentration shows the largest drop in the series having no alkalinity and a low pH. Also the series having a measurable alkalinity show an apparent relationship between the parameter and phosphorus concentration. The lower the pH of the water, the less phosphorus will be in solution, thus indicating that phosphorus will be absorbed by the sediment system in a direct de-pendance upon pH under aerobic conditions. (See also W72-12548) (Jones-Wisconsin) THE INFLUENCE OF TEMPERATURE ON THE REACTIONS OF THE ACTIVATED SLUDGE

REACTIONS OF THE ACTIVATED SLUDGE PROCESS, Research Institute for Water Resources Develop-ment, Budapest (Hungary). Water Quality and Technology Dept. For primary bibliographic entry see Field 05D. W72-12558

THE EFFECTS OF THE WARM WATERS DISCHARGED BY THE KONAKOVO POWER STATION ON THE DISTRIBUTION AND GROWTH OF YOUNG FISH IN THE IVAN-KOVO RESERVOIR, M.P. Boitsov.

Vopr Ikhtiol, Vol 11, No 2, p 325-331, 1971, Illus. Identifiers: Water pollution effects, "Thermal pollution, Bleak, Bream, Discharge (Water), Distribution, Fishes, Growth, "Ivankovo Reservoir, Roach, Rudd, USSR.

Investigations were conducted on the effects of warm water discharge from the Konakovo Power Station of the distribution and growth of fish in the Ivankovo Reservoir. Out of the 10 spp. of fish which were investigated, the young thermophilic fishes (white bream, rudd, bleak) predominated in the warmer regions, as well as roach which is a euthernment of the conductivity of the conduct rythermic fish. As a result of the influence of the warmer waters on all the fish, the vegetative phase of the young fish was prolonged. The monthly increment in the growth of the fish was either the same as that of control fish, or somewhat greater; however, due to the prolonged vegetative period, the venefine were been in serious and in weight. the yearlings were larger in size and in weight.— Copyright 1972, Biological Abstracts, Inc. W72-12559

EVALUATION OF AERATED LAGOONS AS A SEWAGE TREATMENT FACILITY IN THE CANADIAN PRAIRIE PROVINCES, Metropolitan Corp. of Greater Winnipeg

Metropolitan Corp. of Greater Winnipeg (Manitoba). Water Works and Waste Disposal Div. For primary bibliographic entry see Field 05D. W72-12560

DESIGN CONSIDERATIONS FOR EXTENDED

AERATION IN ALASKA, Federal Water Quality Administration, College, Alaska. Cold Climate Research Program. For primary bibliographic entry see Field 05D.

CHEMICAL TREATMENT OF MECHANI-CALLY AND BIOLOGICALLY TREATED WASTE WATER,

Norwegian Inst. for Water Research, Oslo. For primary bibliographic entry see Field 05D. W72-12562

BIOLOGICAL AND CHEMICAL W TREATMENT EXPERIMENTS IN WASTE TREATMENT EXPERIMENTS IN INORTHERN SWEDEN,
For primary bibliographic entry see Field 05D.

W72-12563

BIOLOGICAL SEWAGE TREATMENT IN A COLD CLIMATE AREA, Hokkaido Univ., Sapporo (Japan). Dept. of Sanitary Engineering. For primary bibliographic entry see Field 05D. W72-12564

MICROBIOLOGIC INDICATORS OF THE EF-FICIENCY OF AN AERATED, CONTINUOUS--DISCHARGE, SEWAGE LAGOON IN NORTHERN CLIMATES, North Dakota Univ., Grand Forks. School of

For primary bibliographic entry see Field 05D.

DISINFECTION AND TEMPERATURE IN-

FLUENCES, Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab. For primary bibliographic entry see Field 05D.

W72-12566

STRUCTURE AND FUNCTIONING OF ESTUARINE ECOSYSTEMS EXPOSED TO TREATED SEWAGE WASTES. North Carolina Univ., Chapel Hill. Inst. of Marine

Available from the National Technical Informa-tion Service as COM-71-00688, \$6.00 in paper copy, \$0.95 in microfiche. Annual Report for 1970-1971, February 1971. 345 p, 62 fig, 50 tab, 110 ref. NOAA GH 103.

Descriptors: *Ecosystems, *Productivity, *Estuarine environment, *Domestic wastes, *Salt marshes, *Carbon cycle, *Phosphorus com-pounds, *Nitrogen cycle, *Crabs, *Fishes, Ecology, Food chains, Estuarine fisheries, Marine fisheries, Sewage disposal, Sewage lagoons, Brackish water fish, Biological treatment, Oxidation lagoons, Phytoplankton, Aquatic insects, Waterfowl, Marine algae, Aquiculture.

Identifiers: Meiofauna, Foraminifera.

This is the third annual report from an investiga-This is the third annual report from an investiga-tion of the ecological systems which develop when estuarine waters are enriched with sewage wastes. Various phases of community structure and metabolism of six experimental brackish-water ponds, three of which received treated sewage wastes, and of a small tidal creek and its salt marshes were studied. Included are chapters on productivity carbon metabolism the phosphorous productivity, carbon metabolism, the phosphorous budget, nitrogen, and bacterial heterotrophy; on the standing crops of phytoplankton, decapod crustaceans, fishes, meiofauna, foraminifera, insects, mollusks, and birds; on calcium analysis; sects, mollusks, and birds; on calcium analysis; and on growth and reproduction of algae. The wastes ponds have developed into productive, well integrated, but slightly unstable systems. They perform some of the functions of tertiary treatment and hold promise for production of harvestable seafood protein. (See also W72-12568) (Katz-Washington) W72-12568. W72-12567

MARINE ESTUARINE STUDIES OF ECOSYSTEMS DEVELOPING WITH TREATED SEWAGE WASTES. North Carolina Univ., Morehead City. Inst. of

Marine Sciences.

Available from the National Technical Informa-tion Service as PB-199 537, \$6.00 in paper copy, \$0.95 in microfiche. Annual Report for 1969-1970, May 1970. 364 p, 50 fig, 60 tab, 170 ref.

Descriptors: *Ecosystems, *Food chains, *Productivity, *Succession, *Estuarine environment, *Estuarine fisheries, *Marine fisheries, *Domestic wastes, *Sewage lagoons, *Aquatic productivity, *Carbon cycle, *Zooplankton, *Crabs, Ecology, Physiological ecology, Sewage disposal, Phytoplankton, Benthic flora, Organic loading, Waste assimilative capacity, Bacteria, Crustaceans, Brackish water fish, Marine fungi.

This is the second annual report in a study of ecological systems that develop when treated wastes from municipal sewage systems flow into estuarine waters. Studies by a team of faculty and students considered a small marsh-lined estuary, Students Considered a small mannimed exactly, Calico Creek, which received wastes following secondary treatment, and a set of three ponds in which estuarine water and treated sewage mixture flows. Three control ponds received tapwater and estuarine water. In their second year, the ponds were rich in productivity with successive algal

Group 5C-Effects of Pollution

blooms throughout the year and a food chain cul-minating in blue crabs. Chapters are included on the events in the salinity regime and input management, photosynthetic productivity and respiration, algal growth, phosphorous and nitrogen, bacteria. and animal populations. The presence of a sub-stantial ecological system suggests a viable intermediary system interface is possible between man's municipal wastes and normal estuaries. These systems have potential for aquiculture and waste amelioration. (See also W72-12567) (Katz-Washington) W72-12568

DDT AND PCB IN SOUTH SWEDISH STREAMS,

A. Sodergren, B. Svensson, and S. Ulfstrand. Environmental Pollution, Vol. 3, p 25-36, 1972. 4

Descriptors: *DDT, *Polychlorinated biphenyls, *Water pollution, *Path of pollutants, *Pesticide kinetics, Pesticides, Chlorinated hydrocarbon pesticides, Pesticide residues, Bioindicators, Amphipoda, Streams, Aquatic environment, Pesticide drift, Aquatic life, Ecology, Seasonal, Chromatog-

raphy.
Identifiers: *Pesticide distribution, Gammarus

Gammarus pulex (Amphipoda) was used as an indicator organism in a regional study of the distribution of chlorinated hydrocarbon residues in different streams in southern-most Sweden. Levels of total DDT and PCB residues covaried regionally in spite of the different mechanisms in-volved in the dispersal of the substances. Seasonal changes seemed to be correlated with runoff conditions. Only diffuse relationships between residue levels and the age and trophic levels of organisms in a stream ecosystem were found. This suggests that transport routes and accumulation processes are much more complicated and inter-specifically variable phenomena than is often assumed. (Svensson-Washington) W72-12569

DDT RESIDUES: DISTRIBUTION OF CONCEN-TRATIONS IN EMERITA ANALOGA (STIMP-SON) ALONG COASTAL CALIFORNIA, Stanford Univ., Pacific Grove, Calif. Hopkins

Marine Station.

Science, Vol. 174, p 606-608, November 5, 1971. 1 fig. 1 tab. 13 ref.

Descriptors: *Pesticide residues, *DDT, *DDE, *DDD, *Waste water (Pollution), *Water pollution sources, Pesticides, Insecticides, Chlorinated hydrocarbon pesticides, Water pollution, Sediments, Industrial wastes, Chemical wastes, Crabs, Absorption, Pesticide drift, Sewage effluents. Identifiers: Sand crabs, *Emerita spp., Biological magnification

The total concentrations (tDDT) of DDT, DDD, and DDE in Emerita analoga from 19 California beaches reflect tDDT contamination nearby. Animals near the Los Angeles County sewer out-fall contain over 45 times as much tDDT as animals near major agricultural drainage areas. Sediments near the outfall probably contain over 100 metric tons of tDDT--a reservoir for input into marine organisms. The effluent from a plant that manufactures DDT is a probable source. (Svensson-Washington) W72-12570

INVESTIGATIONS INTO THE TOXICITY OF YELLOW PHOSPHOROUS TO FISH, Memorial Univ. of Newfoundland, St. John's.

In: Proceedings of the Canadian Society of Wildlife and Fishery Biologists, Atlantic Chapter Annual Meeting, November 4-6, 1970, Frederiction, New Brunswick, p 138-139. 4 ref.

Descriptors: *Phosphorous, *Fish physiology, *Fishkill, *Industrial wastes, *Toxicity, *Lethal limit, Bioassay, Mortality, Water pollution effects, Salmon, Trout, Herrings, Aquatic environment, Chemical wastes, Fish diseases, Pathology, Asimolarchical wastes, Fish diseases, Pathology,

Animal pathology.

Identifiers: *Yellow phosphorous, Cod, Hemolysis, Hematocrits, Red herring.

Yellow phosphorous has been demonstrated to be lethal to fish at concentrations as low as 0.5 micro-grams/1. Herring, salmon and trout turned red and showed signs of extensive hemolysis and reduced hematocrits. Cod, in contrast, did not exhibit any of these phenomena. Brief exposures of salmon or cod to yellow phosphorous resulted in delayed mortalities, which in some cases was as long as 2-3 weeks. (Svensson-Washington) W72-12573

YELLOW ACCUMULATION PHOSPHOROUS BY SEVERAL MARINE IN-VERTEBRATES AND SEAWEED, Memorial Univ. of Newfoundland, St. John's.

G. L. Fletcher.

Journal of the Fisheries Research Board of Canada, Vol. 28, No. 5, p 793-796, 1971. 1 tab, 14

*Phosphorous, Descriptors: *Absorption, Animal physiology, Marine animals, Marine plants, Lobsters, Clams, Mussels, Bioassay. Identifiers: "Seaweed, "Biological magnification, "Marine invertebrates, "Yellow phosphorous, Quahogs, Periwinkles, Starfish."

Lobsters, clams, quahogs, periwinkles, mussels, starfish, and seaweed accumulated yellow phosphorous from seawater containing this element. In an experiment exposing all of the organisms to 15 plus or minus 9 micrograms/liter of yellow phosphorous for 48 hr, the concentration of yellow phosphorous in whole animals ranged from 10 (mussels) to 40 (periwinkles) times the seawater level. The highest concentrations of yellow phosphorous were found in the pyloric caeca of starfish (100 times seawater), and in the ovary and hepatopancreas of lobster (300 and 100 times seawater). Periwinkles, mussels, seaweed, and a quahog, clam, and starfish contained no yellow phosphorous seven days after transfer to seawater free of yellow phosphorous. (Svensson-Washington) W72-12574

IMPROVED METHOD OF TREATING PONDS WITH ANTIMYCIN A TO REDUCE SUNFISH POPULATIONS, Southeastern Fish Control Lab. Warm Springs,

In: Proceedings of the 24th Annual Conference of the Southeastern Assn. of Game and Fish Com-missioners, 1970, p 464-472. 3 tab, 8 ref.

Descriptors: *Piscicides, *Antimycin A, *Sunfishes, *Chemcontrol, *Crappies, *Rates of application, Pesticides, Fish, Fish management, Fish control agents, Fish populations, Fisheries, Ponds, Largemouth bass, Application methods. Identifiers: White crappie.

A new method of using antimycin to thin overcrowded sunfish populations was tested in five ponds from 2.8 to 8.2 acres in surface area. Concentrations of 0.6 to 1.6 micrograms per liter of an-timycin applied in the shallow upper ends of the ponds removed from 21.0 to 102.1 pounds per acre of sunfishes, but killed almost no largemouth bass of any size. The partial treatment method worked

well in every pond in which it was tested despite some wide diurnal fluctuations in pH. (Svensson-Washington) W72-12575

THE EFFECT OF MARINE POLLUTANTS ON LAMINARIA HYPERBOREA, Marine Biological Station, Port Erin, Isle of Man

R. Hopkins, and J. M. Kain. Marine Pollution Bulletin, Vol. 2, No. 5, p 75-77, May 1971. 1 tab, 3 ref.

Descriptors: *Algae, *Bioassay, *Plant physiology, Pollutants, *Toxicity, Water pollution effects, Respiration, *Heavy metals, Chemical wastes, Mercury, Copper, Zinc, Pesticides, Pesticide toxicity, *Herbicides, Dalapon, 2-4-D, Insecticides, Phenols, *Detergents, *Lethal limit, Alkylbenzene sulfonates.

Identifiers: *Laminaria, Sublittoral region, Culture experiments, Atrazine, MCPA, Endosulfan, Fairy liquid, Blusyl, Sodium lauryl, Ether sulfate, Sodium dodecyl, Benzene sulfonate, Coconut fatty acid, Pluronics, Diethanolamide.

A study has been made of the toxic concentrations of 15 chemical pollutants, including examples of heavy metals, detergents, and herbicides, using Laminaria hyperborea as the test organism. This plant is ecologically the most important in the sublittoral region around much of the coast of Britain. Two different bioassay techniques were used, one of a culture experiment type, and the other utilizing respiration measurements. (Svensson-Washington)

EFFECT OF ENVIRONMENTAL FACTORS ON BENTHAL OXYGEN UPTAKE,

Pennsylvania State Univ., University Park.
A. J. McDonnell, and S. D. Hall. Journal of the Water Pollution Control Federation, Vol. 41, No. 8, Part 2, p R353-R363, August 1969. 7 fig, 5 tab, 20 ref. OWRRA-003-PA (5).

Descriptors: *Baseline studies, *Biochemical oxygen demand, *Oxygen requirements, Water temperature, Dissolved oxygen, Oxygen, Aquatic environment, Tubificids.

Identifiers: *Environmental influence, *Benthal deposits, Eutrophic streams, Benthic fauna, Benthic community, Chironomids, Invertebrates. Macroinvertebrates,

An attempt to define the relative effects of such factors as oxygen concentration, temperature, and the character of the biological community, on the oxygen demand of benthal deposits sampled from ildly polluted eutrophic stream is presented. It was found that oxygen uptake rates of the benthal systems are dependent on oxygen concentration and temperature, and essentially independent of sample depth. The presence of measurable densities of macroinvertebrates proved significant to the characteristics of the benthal response. An at-tempt has been made to approximate the demands associated with microbial and invertebrate respiration, thereby delineating the relative importance of each. (Svensson-Washington) W72-12578

STUDY OF MIGRATORY PATTERNS OF FISH AND SHELLFISH THROUGH A NATURAL PASS,

Texas Parks and Wildlife Dept. Austin.

B. D. King, III.

Available from the National Technical Information Service as COM-72-10407, \$3.00 in paper copy, \$0.95 in microfiche. Texas Parks and Wildlife Dept., Technical Series No. 9, 1971. 54 p, 20 fig, 34 tab, 70 ref. NOAA 2-55-R. Descriptors: "Baseline studies, "Spatial distribu-tion, "Distribution patterns, "Commercial fish, "Commercial shellfish, "Texas, "Migration pat-terns, Temporal distribution, Ecological distribu-tion, Vertical distribution, Horizontal distribution,

tion, Vertical distribution, Horizontal distribution, Crustaceans, Shrimp, Aquatic animals, Pink shrimp, Crabs, Drums, Sea water, Estuarine en-vironment, Seasonal. Identifiers: "Seasonal abundance, "Abundance, Penaeus spp., Environmental variables, Brown shrimp, White shrimp, Blue crabs, Red drums, Black drums, Flounders, Southern flounders, Sheepsheads, Seatrout, Spotted seatrout, Statisti-

The movements of commercially important species of fish and crustaceans through Cedar Bayou inlet, Texas were monitored to determine the spatial distribution and seasonality of each species and to identify environmental factors which cause or affect movements between oceanic and estuarine waters. The species studied included the brown, pink and white shrimps, blue crab, red drum, black drum, southern flounder, sheepshead, and spotted seatrout. Data concerning the seasonal abundance and vertical and horizontal distribution of each species are presented and the results of statistical analyses of correlated environmental variables are discussed. (Svensson-Washington) W72-12579

A REVIEW OF LITERATURE ON TFM (3-TRIFLUOR-METHYL-4-NITROPHENOL) AS A LAMPREY LARVICIDE, Bureau of Sport Fisheries and Wildlife La Crosse, Wis. Fish Control Lab.

R. A. Schnick.

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Bureau of Sport Fisheries and Wildlife, Investiga-tions in Fish Control, No. 44, April 1972. 31 p, 162 ref. 2 append.

Descriptors: *Pesticides, *Larvicides, *Lampreys, *Pest control, *Reviews, *Chemcontrol, Aquatic environment, Piscicides, Pesticide residues, Pesticide toxicity, Pesticide drift, Pesticide kinetics, Great Lakes, Water chemistry. Identifiers: *TFM, *Lampricides, *3-trifluormethyl-4-nitrophenol, Non-target organisms.

The search for a selective toxicant to control the sea lamprey culminated in the discovery of TFM in the late 1950's. The research, however, had only in the late 1950 s. The research, nowever, nad only begun on its chemical and physical properties, efficacy, toxicity to non-target and target species, residues, and required methods. Federal, State, university and industrial agencies contributed much in the effort to determine the effect of TFM. on the environment and other organisms; how-ever, much still remains to be done if TFM is to gain continued clearance by the Environmental Protection Agency for use as a larval lampricide in the aquatic environment. (Svensson-Washington) W72-12580

BILL OF RIGHTS FOR LAKE MICHIGAN, House, Washington, D.C. For primary bibliographic entry see Field 06E. W72-12585

RADIOISOTOPIC STUDY OF CALCIFICATION IN THE ARTICULATED CORALLINE ALGA BOSSIELLA ORBIGNIANA, California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.

Journal of Phycology, Vol. 8, No. 1, p 88-97,

March 1972. 10 fig, 39 ref. Descriptors: *Photosynthesis, Calcium chloride, Radioactivity techniques, Metabolism, Tracers, Radioactivity, Carbon dioxide, Salts, Marine al-

gae. Identifiers: *Calcification, *Coralline algae, Calci-um radioisotopes, *Bossiella orbigniana, Paper chromatography, Scintillation counting, Ca-45.

In an attempt to link calcification to photosynthetic processes in plants, 2-3 cm branches of Bossiella orbigainan were separated from the plants and incubated in light or dark in Millipore filtered seawater containing 2 microcuries/ml Ca-45 as calcium chloride. After 32 hr incubation, the branches were washed, post-incubated in media free of Ca-45, and the media periodically assayed for Ca-45 activity by methods of decalcification, scintillation counting, and paper chromatography. Data indicate that calcification in Bossiella orbigniana (Corallinaceae) is characterized by a series of features which vary according to the age of the segment at the branch tip to older, more basal segments: (1) weight and degree of mineralization increase, while rate of weight gain decreases; (2) rate and stability of Ca-45 labeling are decreases, while effect of light on Ca-45 labeling rate decreases; she effect of light on Stability of label increases; however, for all segments, Ca-45 labeling is more rapid and more stable in the light than in the dark; (4) rate of Ca-45 labeling in killed controls decreases. Comparative studies with the tropical coralline alga Amphiroa yielded similar results. Characteristics of the gradients in calcification and effect of light in these coralline algae are very similar to those found in a reef-building coral containing symbiotic algae, and the data suggest that organic products of photosynthesis may be of general importance to calcification. (Mackan-Battelle)

STUDIES ON THE EXCREMENTS OF THE FISH, Nihon Univ., Tokyo. Coll. of Agriculture and

Veterinary Science.
T. Kobashi, and Y. Deguchi.
Bull Coll Agric Vet Med Nihon Univ. 28. 92-99.

Identifiers: *Fish physiology, *Fish management, Carassius auratus, Carassius carassius, Cyprinus carpio, Excrements, Fish, Ponds.

The problem of fish excrements in fish-pond management, was studied. The mucus width in excrements becomes thin in Carassius auratus, Cyprinus carpio and Carassius carassius. The number of mucus cells of the posterior intestine is more than that of the anterior intestine. Excretion time is affected by water temperature; in low water temperature excretion time becomes longer. The proportion of the excrement weight to the food weight was 5.0% in Cyprinus carpio, 6.2% in Carassius carassius and 6.8% in Carassius auratus.—Copyright 1972, Biological Abstracts, Inc. W72-12636

CHARACTERIZATION OF NATURALLY OC-CURRING DISSOLVED OR-GANOPHOSPHORUS COMPOUNDS, Washington Univ., Seattle. Dept. of Civil En-

gineering.
R. A. Minear.
Environmental Science and Technology, Vol. 6,
No. 5, p 431-437, May 1972. 11 fig, 6 tab, 30 ref.

Descriptors: *Algae, *Phosphorus, *Lakes, Cultures, Phosphates, Nutrients, Chlorophyta, *Organophosphorus compounds, Washington, Separation techniques, Distillation, Spectrophotometry, Chlorophyll, Hydrolysis, Phytoplankton, Fluorescence, Phosphorus compounds, Chlamydomonas, Water analysis, Fluorometry, Pigments.
Identifiers: *Orthophosphates, Chlamydomonas reinhardtii, Moses Lake, Pine Lake, Lake Washington, Chlorophyll a, *DNA, *Dissolved organophosphorus compounds, Natural organics.

Two sources of dissolved organic phosphorus compounds (DOP) were used in a study concerned with the formation and mechanisms of release of DOP compounds in natural waters: (1) pure cultures of the green alga, Chlamydomas reinhardtii,

grown in a carbon-dioxide enriched atmosphere; and (2) natural water samples taken from three separate lakes. Spectrophotometry was used for orthophosphate determination and DNA analyses. Chlorophyll a and total pigment were determined fluorimetrically. In the pure algal cultures, high levels of soluble organic phosphorus were obtained with accompanying low residual orthophosphate. Molecular sieve samples of the natural lake water samples showed that up to 20 percent of the recoverable organic phosphorus is high-molecular-weight material. A sizable percentage (up to 50 percent) of this material appeared, in most cases, to be DNA or its fragments. The natural origin of the DOP, especially, DNA, and other high-molecular-weight components was substantiated in special culture studies which utilized dual chamber vessels divided by 0.22 micron membranes. The presence of DNA in the pure algal cultures and the correlation with chlorophyll and total pigment for natural water samples suggest that this material originates from the phytoplankton. (Mortland-Battelle)

AMINO ACID TRANSPORT IN NITZSCHIA OVALIS ARNOTT, California Univ., Irvine. Dept. of Developmental and Cell Biology.

B. B. North, and G. C. Stephens.
Journal of Phycology, Vol. 8, No. 1, p 64-68, March 1972. 2 fig, 2 tab, 19 ref.

Descriptors: *Amino acids, *Diatoms, *Absorption, Metabolism, Nitrogen, Chrysophyta, Carbon radioisotopes, Tracers, Chemical analysis, Radioactivity techniques, Path of pollutants, Inhibition, Marine plants. Identifiers: Absorption rates, *Nitzschia ovalis, Arginine, Lysine, Glutamate, Glycine, Serine, Scintillation counting, Maximum uptake velocity, C-14. Accumulation

C-14, Accumulation.

In order to test the amino acid uptake of the marine diatom Nitzschia ovalis, C-14-labeled amino acids were added to harvested cell suspensions at concentrations of 1 microcurie/20 ml (15.0-43.0 micromoles/l), depending upon the amino acid: arginine, lysine, glutamate, glycine, or serine), and the subsequent uptake rates were determined by (1) periodically taking 1 ml aliquots of cell suspensions, filtering them, and placing them in scintillation vials for counting, and (2) removing cells by centrifugation from a portion of the medium and determining the radioactivity present in 1 ml of medium. Cell nitrogen was measured with a nitrogen analyzer. It was determined that N. ovalis possesses at least 3 amino acid uptake systems, specific for transport of acidic, polybasic, and neutral amino acids. Maximum uptake velocity (V sub max) for each site is inversely related to the nitrogen content of the cell, and to the nitrogen available in the culture medium. It appears that high concentrations of nitrogen repress amino acid transport, while under natural conditions (low N2) amino acid uptake may significantly contribute to the N2 economy of Nitzschia populations. (Mackan-Battelle)

THE EFFECTS OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF PIKE PERCH YEARLINGS (LUCIOPERCA LUCIOPERCA) AND ROACH YEARLINGS (RUTILUS RUTILUS HECKELI (NORDM.)) IN VARIOUS REGIONS OF THE SEA OF AZOV, Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).

T. M. Avedikova.

Vopr Ikhtiol. Vol 11, No 3, p 484-494, 1971. Illus. Man.

Map. Identifiers: *Environmental effects, Aquatic environment, *Fish populations, Distribution, Environment, Lucioperca lucioperca, Nutrition, Perches, Roach, Rutilus rutilus, Rutilus rutilus heckeli, Salinity, USSR, Yearlings, Sea of Azov.

Group 5C-Effects of Pollution

The effects of salinity and nutrition on the distribution of pike perch (Lucioperca lucioperca) and roach (Rutilus rutilus heckeli) yearlings in the Sea of Azov were evaluated. Ecologic studies showed that salinity affects the yearling only at lethal or sublethal concentrations, but is usually superseded by the importance of nutritional facsuperseded by the importance of nutritional rac-tors. Furthermore, the area occupied by the pike perch and roach depends on the size of the popula-tion and, alone, cannot be interpreted as indicating the effects of salinity on these fishes. The distribu-tion of pike perch and roach yearlings was always related to the quantity of food in a given region (r = 0.91 plus or minus 0.08 at n = 25 and p = 0.95, and r = 0.89 plus or minus 0.04 at n = 23 and p =0.95, respectively). The biomass of the benthos was always greater at decreased salinity.--Copyright 1972, Biological Abstracts, Inc. W72-12645

SALINITY TOLERANCE OF COMMON CARP:

(CYPRINUS CARPIO, L.), Ministry of Agriculture, Baghdad (Iraq). Div. of Hydrobiology and Fisheries. M. I. Al-Hamed.

Bull Iraq Nat Hist Mus (Univ Baghdad). Vol 5, No 1, p 1-7, 1971, Illus.

Identifiers: *Carp, Cyprinus carpio, Salinity, *Salt

C. carpio, ranging in length from 8.5 to 12.7 cm were exposed directly and gradually to different salinity levels. In direct exposure experiments, fish lived at salinities as high as 12% for 10 wk (the duration of the experiment). Higher salinities proved unfavorable. In gradual acclimatization experiments during a period of 4 days fish lived at salinities as high as 17%, but higher levels were lethal. Fertilized ova of carp hatched at salinities from 2% to 10%, but the favorable level was up to 6.6%.—Copyright 1972, Biological Abstracts, Inc. W72-12647

THE SEDIMENT-INHABITING TESTATE AMOEBAE (RHIZOPODA, TESTACEA) FROM THE FINSTERTALER SEEN (TYROL/AUSTRIA), (SEDIMENTEWOHNENDE SCHALENAMOBEN RHIZOPODA, TESTACEA) DER FINSTERTALER SEEN (TIROL)),

Biological Station, Lunz am See (Austria). For primary bibliographic entry see Field 05A. W72-12653

ELECTROENCEPHALOGRAPHIC STUDIES OF THE EFFECT PRODUCED BY THE DRINKING WATER TEMPERATURE ON MAN, Nauchno-Issledovatelskii Gigieny,

Moscow (USSR).

P. I. Shpil'Berg, and I. A. Kibal'Chich. Gig Sanit. Vol 36, No 3: p 14-19, 1971. Illus. En-

glish summary. Identifiers: *Heated water, *Public health, Potable water, Electroencephalographic studies, Water

An urgent hygienic problem arises with the increase of temperature of surface waters due to the discharge of thermal waters from electric power stations. An EEG method was used to study the effect of thirst and its quenching with water of different temperature levels. The changes in the EEG obtained point to a high excitation of the CNS as the result of thirst. This condition disappeared at the quenching of thirst with water of 20 deg. However, drinking of warm water (25-30 deg) did not alter the changes of EEG produced by the thirst. The persons under observation drank 30-50% less warm water than cold. In the discharge of thermal waters a rise of the temperature of water in a stream serving as a source of water supply above 25 deg is highly undesirable.--Copyright 1972, Biological Abstracts, Inc. THE POLAROGRAPHIC ESTIMATION OF BAYLUSCIDE, National Research Centre, Cairo (Egypt).

For primary bibliographic entry see Field 05A. W72-12664

AN ANNOTATED BIBLIOGRAPHY OF AT-TEMPTS TO REAR THE LARVAE OF MARINE FISHES IN THE LABORATORY, Scripps Institution of Oceanography, La Jolla,

R. C. May.

For sale by the Superintendent of Documents, U S. Government Printing Office, Washington, D. C. 20402 Price \$0.35. National Oceanic and Atmospheric Administration, NOAA Technical Report NMFS SSRF-632, August 1971. 24 p, 68 ref, 2

Descriptors: *Marine fish, *Larvae, *Laboratory animals, *Bibliographies, *Nutrient requirements, *Aquiculture, *Fish eggs, Reviews, Fish behavior, Fish physiology, Animal growth, Growth rates, Mortality, Fish diets, Temperature, Fish hatcheries, Fish farming, Fish food organisms.

Identifiers: *Fish rearing, Feeding experiments,

A bibliography was compiled of 68 papers, arranged alphabetically by authors' names, which describe attempts to rear the larvae of marine fishes in the laboratory, covering the period 1878 to 1969. Annotations summarize each paper, and appendixes list the species of fishes studied and the types of food used. (Svensson-Washington)

SUBLITTORAL ECOLOGY OF THE KELP BEDS OFF DEL MONTE BEACH, MONTEREY,

Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 05A. W72-12670

MARINE FOULING ORGANISMS IN MON-TEREY HARBOR, CALIFORNIA, J. THROUGH SEPTEMBER 1966, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 05A.

W72-12671

THE GROWTH AND SURVIVAL OF PLANTED CLAMS, MERCENARIA MERCENARIA, ON THE GEORGIA COAST, Georgia Game and Fish Commission, Brunswick.

Marine Fisheries Div. For primary bibliographic entry see Field 05A. W72-12672

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT, FINAL REPORT. SEC-TION 2: BENTHIC STUDIES. National Marine Fisheries Service, Highlands,

N.J. Sandy Hook Lab.

Available from the National Technical Informa-You and the National Technical Montain Carlotton Service as AD-739 532, \$3.00 in paper copy, \$0.95 in microfiche. Report to Army Corps of Engineers, Coastal Engineering Research Center, February 1972, 273 p, 149 fig, 10 tab.

*Benthic fauna, *Invertebrates, *Molluscs, *Water pollution, *Metals, *Coliforms, Animal pathology, Sludge disposal, New York, Solid wastes, Waste disposal, Water quality, Atlantic Ocean, Marine bacteria, Worms. Identifiers: *New York Bight, *Benthic meiofauna, *Dredging spoils, *Polychaeta, Species diversity, Meiofaunal communities, Species distribu-tion, Amphipoda, Decapoda, Pelecypoda, Spisula,

Results of studies to evaluate the effects of solid waste disposal on the marine environment of the New York Bight are presented. Section two con-tains a study of the distribution of the benthic meiofauna and macrofauna relative to the waste disposal, benthic microbiology, pathological effects of wastes on larger benthic crustaceans and an investigation of the basic chemical variables affecting species diversity. (Katz-Washington) W72-12673

RESPIRATORY RESPONSE OF THE TELEOST POECILIA RETICULATA TO RISING TEM-PERATURE

Texas Univ., Port Aransas.

Comparative Biochemistry and Physiology, Vol. 40A, p 851-853, 1971. 1 fig, 5 ref.

Descriptors: *Respiration, *Teleosts, Fish physiology, Oxygen requirements, Water temperature, Thermal stress, Bioassay. Identifiers: Poecilia reticulata, Respiratory rates.

The respiratory rate of Poecilia reticulata was measured while the temperature increased from 25 to 30 C at a rate of 0-25 C/min. There was a rapid initial increase in oxygen consumption that stopped when the temperature rise was completed. This was followed by a level of oxygen uptake that was higher than the initial rate and had a Qsub10 of 1.7. The rapidity of the responses indicates nervous mediation, and/or a direct effect of tempera-ture on individual cells rather than an endocrine control. (LeGore-Washington) W72-12674

EXCRETION OF UREA BY TWO TELEOSTS EXPOSED TO DIFFERENT CONCENTRA-TIONS OF AMBIENT AMMONIA,

Michigan State Univ., East Lansing. K. R. Olson, and P. O. Fromm. Comparative Biochemistry and Physiology, Vol. 40A, p 999-1007, 1971. 1 fig, 2 tab, 20 ref. EPA 18050DST.

Descriptors: *Ammonia, *Ureas, *Rainbow trout, Nitrogen compounds, Teleosts, Trout, Bioassay, Proteins, Fish physiology. Identifiers: *Excretion, *Goldfish, Salmo gairdneri, Carussius auratus.

The effect of the increase of ambient ammonia on urea excretion in two teleosts has been studied. Rainbow trout show little alteration in their overall nitrogen excretion pattern with the exception of decreased ammonia excretion as ambient ammonia increased. Long-term exposure to ammonia had little effect on urea excretion rates of trout. Goldfish showed a significant increase in urea excretion rates as ambient ammonia increased. These excretion rates were dependent on the prevailing acclimation ammonia concentrations and duration of acclimation. (Svensson-Washing-W72-12675

THE EFFECTS OF DIFFERENT ACCLIMA-TION TEMPERATURES ON GAS SECRETION IN THE SWIMBLADDER OF THE BLUEGILL SUNFISH, LEPOMIS MACROCHIRUS, Virginia Polytechnic Inst. and State Univ., PGFF(IVBTta D*)* HCMmPkaic

Blacksburg. R. A. McNabb, and J. A. Mecham. Comparative Biochemistry and Physiology, Vol. 40A, p 609-616, 1971. 6 fig, 1 tab, 17 ref.

Descriptors: *Sunfishes, *Buoyancy, Water temperature, Thermal properties, Freshwater fish, Fish physiology, Oxygen, Carbon dioxide. Identifiers: *Swimbladders, *Gas secretion, *Bluegill sunfish, Acclimation temperatures, Lepomis macrochirus.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Effects of Pollution—Group 5C

After acclimation to 12, 22 or 32 C, the swimbladders of bluegill sunfish (Lepomis macrochirus) were partially deflated. Rates of gas secretion into the bladder were measured. Total gas secretion, measured as the rate of reinflation, was temperature independent. The rates of oxygen secretion into the swimbladder increased with increasing acclimation temperature; simultaneously, the rate of carbon dioxide secretion decreased. (LeGore-Washington) W72-12676

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fish, tion, STUDY ON THE BIO-ASSAY METHOD FOR THE EVALUATION OF WATER POLLUTION-II. USE OF THE FERTILIZED EGGS OF SEA URCHINS AND BIYALVES,

URCHING AND BYFALVES, K. Okubo, and T. Okubo. Bulletin of the Tokai Regional Fisheries Research Laboratory, No. 32, p 131-140, January 1962. 2 fig, 2 tab, 5 ref. English summary.

Descriptors: *Bioassay, *Laboratory animals, *Toxicity, *Mussels, *Oysters, *Testing procedures, Marine animals, Marine biology, Phenol, Bioindicators.

Identifiers: *Artificially fertilized eggs, *Sea urchins, *Bivalves, *Disturbed metamorphosis, Test, organisms.

Hemicentruits. urchins, *Bivalves, *Disturbed metamorphosis, Test organisms, Hemicentrotus spp., Anthocidanis spp., Crassostrea spp., Mytilus spp., Sodium cyanide, Mercuric chloride, Copper acetate, Copper sulfate, Ferric chloride, Manganese chloride, Zinc sulfate, Chromium sulfate, Ammonium chloride, Ammonium acetate, Chrome alum, Picric acid, Tannic acid, Parathion, Uranine, Rhodamine B, Alcohol, Acetone, Chloroform, Pulping waste.

A method of bioassay has been developed by using artificially fertilized eggs of sea urchins and bivalves as test organisms. The procedures of bioassay with fertilized eggs of the test organisms are described and the results obtained for various pollutants are compared. The method proposed in this report is advantageous because the effects of pollutants on the development of eggs were easily recognizable in disturbed metamorphosis. Four species tested, two species each for sea urchins and bivalves, were similar in sensitivity to pollutants. The sensitivity of the present test organisms tants. The sensitivity of the present test organisms to pollutants was much higher than that shown by other test organisms. The morphologically ineffec-tive concentration of some pollutants for the emb-ryonic development of sea urchins and bivalves may be directly equal to the safe level of the pollu-Washington)
W72-12677

POLYCHLORINATED BIPHENYLS AND OR-GANOCHLORINE PESTICIDES IN SOME FRESHWATER AND MARINE FISHES, Fisheries Research Board of Canada, St. Andrews

(New Brunswick).

Bulletin of Environmental Contamination and Toxicology, Vol. 6, No. 5, p 464-470, 1971. 2 fig, 1 tab, 12 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Polychlorinated biphenyls, *Fish, Pesticides, Insecticides, DDD, DDE, DDT, Heptachlor, Dieldrin, Aroclors, Pollutant identification, Analytical techniques, Chromatography, Marine fish, Freshwater fish, Eels, Atlantic salmanner 1881, Freshwater 1881, Eels, Adatus Sairmon, Herrings, Mussels, Perches, Absorption, Pesticide kinetics, Path of pollutants. Identifiers: Lindane, Epoxide, Hexachlorobenzene, Cod, Mackerels, Pickerels, Plaice, Ocean perch, White hake, Hake.

Samples of ten species of freshwater and marine fish collected in New Brunswick and Nova Scotia were extracted with hexane, concentrated by evaporation, separated on an alumina column, and the fractions were analyzed by gas chromatography for PCB, DDT, DDE, DDD, and C6C16. Error due to differences between commercial PCB and PCB found in the samples was difficult to estimate. Of the organochlorine pesticides, DDE was present in highest concentrations, followed by DDT and DDD. Most of the samples contained a small amount of hexachlorobenzene. (Svensson-Washington) W72-12679

A PRELIMINARY INVESTIGATION: THE EF-FECT OF ELEVATED TEMPERATURE ON THE AMERICAN OYSTER CRASSOSTRA VIRGINICA (GMELIN), A SYMPOSIUM, Florida Dept. of Natural Resources, St. Peter-

Professional Papers Series Number 15, June 1971. 190 p, 77 fig, 29 tab, 546 ref, 5 color plates.

Descriptors: *Thermal pollution, *Water temperature, *Water pollution effects, *Thermal stress, *Oysters, *Animal pathology, *Metabolism, *Physiological ecology, *Bioassay, *Reproduction, Temperature, Water pollution, Water quality, Water pollution sources, Stress, Aquatic animals, Benthic fauna, Commercial shellfish, Investigheries, Marine animals, Mollucks, Shellfish animals, Benthic fauna, Commercial shellfish, Invertebrates, Marine animals, Mollusks, Shellfish, Benthos, Shellfish farming, Pathology, Animal metabolism, Animal growth, Growth, Animal physiology, Bioindicators, Proteins, Biochemistry, Carbohydrates, Lipids, Metals, Gonads, Sexual maturity, Parasitism, Animal parasites, Diseases, Ecology, Seasonal, Fluctuations, Heat resistance.

sistance.

Identifiers: *Crassostrea spp., *Invertebrate pathology, *Sublethal effects, *Histological studies, Glycogen, Fat content, Gonadal development, Labyrinthomyxa spp., Dermocystidium ment, Labyrinthomy spp., Gametogenesis.

This preliminary investigation studied the effects of constant 35 C temperature on the survival and well being of Crassostrea virginica. The basic parameters considered were: (1) fluctuations of chemical composition in tissues, (2) seasonal conchemical composition in tissues, (2) seasonal condition, (3) histology, (4) parasitology, particularly Labyrinthomyxa marina (Formerly Dermocystidium marinum), and (5) changes in reproductive activity. Substantial mortalities generally did not occur at constant temperatures of 35 C and approximate field salinities, but a variety of responses were observed including altered gametogenesis, glycogen decreases and tissue damage. The use of histology to delineate sublethal effects was an extremely valuable tool. (LeGore-Washington) W72-12680

EFFECTS OF DELAYED INITIAL FEEDING ON LARVAE OF THE GRUNOIN, LEURESTHES TENUIS (AYRES), Scripps Inst. of Oceanography, La Jolla, Calif. R. C. May. Fishery Bulletin, Vol. 69, No. 2, p 411-425, 1971. 4 fig, 7 tab, 50 ref.

Descriptors: *Silversides, *Larvae, *Growth rates, *Nutrient requirements, Fish, Animal growth, Mortality, Fish behavior, Fish physiology. Identifiers: *Grunion, *Starvation, Feeding experiments, Leuresthes spp.

The initial feeding of newly hatched larvae of the The initial feeding of newly hatched larvae of the grunion was delayed for various periods of time under laboratory conditions at 18 C. Unfed larvae did not develop morphologically beyond the stage reached at the time of yolk absorption, about 4 days after hatching, although some survived as long as 3 weeks. Regardless of how long initial feeding was delayed, 80% or more of previously feeding was delayed, 30% or more of previously unfed larvae began feeding when food was made available to them, and at least 40% of the larvae alive when food was offered were able to survive to the end of a 20-day experiment. When food was offered to starved larvae, growth began and generally proceeded at about the same rate as in larvae fed from day 1, although there was some indication that a few days' delay in initial feeding increased the conversion efficiency of grunion larvae feeding on Artemia nauplii. Grunion larvae probably do not experience high mortality at sea due to starvation, nor do they exhibit a classical 'critical period' at the time of yolk absorption. (Svensson-Washington)

TOLERANCE OF EMBRYOS OF MARINOGAMMARUS MARINUS AND ORCHESTIA GAMMARELLA (AMPHIPODA) TO LOWERED SALINITIES, Delta Inst. for Hydrobiological Research, Yerseke

Deta inst. 101 ryutobiological Research, 1ersexe (Netherlands). A. G. Vlasblom, and G. Bolier. Netherlands Journal of Sea Research, Vol. 5, No. 3, p 334-341, 1971. 3 fig, 3 tab, 14 ref.

Descriptors: *Amphipoda, *Aquatic environment, *Salinity, *Embryonic growth stage, *Animal physiology, Aquatic animals, Bioassay, Hatching, Water quality. Identifiers: Marinogammarus spp., Orchestia spp.,

Investigation was made into the tolerance to lowered chlorinities (4 and 7 ppt) of embryos of M. marinus and O. gammarella. The rate of development remained constant, but the number of hatched juveniles declined with chlorinity. The egg membrane of both species provides only slight protection against dilution of the medium, since isotonicity of the extra-embryonic fluid with the medium is reached fairly rapidly. The brood production of a population of M. marinus living in 4 ppt Cl' is considerably reduced. (Svensson-Washington) W72-12683

SKEWED ALGAL DIVISION PATTERNS: EFFECTS OF AUTOSPORE YIELD ON COM-PUTED SYNCHRONY INDICES, Saint Louis Univ., Mo. Dept. of Biology. For primary bibliographic entry see Field 05A.

PHYTOPLANKTON PIGMENTS IN PORTO NOVO WATERS (INDIA), Center of Advanced Study in Marine Biology, Porto Novo (India). For primary bibliographic entry see Field 05A. W72-12725

HYDROBIOLOGICAL STUDIES IN THE CATCHMENT OF VAAL DAM, SOUTH AFRICA. PART 2. THE EFFECTS OF STREAM AFRICA. PART 2. THE EFFECTS OF STREAM
CONTAMINATION ON THE FAUNA OF
STONES-IN-CURRENT AND MARGINAL
VEGETATION BIOTOPES,
National Inst., for Water Research, Congella.
(South Africa). Regional Lab.
E. M. Chute.

F. M. Chutter.

Internationale Revue der Gesamten Hydrobiologie, Vol 56, No 2, p 227-240, 1971. 9

Descriptors: *Aquatic animals, *Aquatic environ-ment, *Water pollution effects, *Monitoring, Chemical analysis, Limiting factors, *Nutrients, Toxicity, Resistance, Aquatic populations, Rivers, Streams, Crustaceans, Copepods, Dissolved ox-ygen, Nitrogen, Ammonia, Caddisflies, Nitrates, ygen, Nitrogen, Ammonia, Caddisflies, Nitrates, Sulfates, Sodium, Turbidity, Effluents, Water quality, Nematodes, Tubificids, Cyanophyta, Water analysis, Aquatic habitats, Periphyton, Sampling, Midges, Aquatic insects, Mayflies, Larvae, Environmental effects, Annelids, Physiochemical properties. Identifiers: Biotopes, Vaal Dam (South Africa), Macroinvertebrates, Phormidium, Nais spp., Bur-

Group 5C-Effects of Pollution

nupia spp., Thiochaete chutteri, Neurocaenis, Centroptilum excisum, Micronecta spp., Cloeon spp., Pseudogrion spp., Chaetogaster, Chironomus spp., Choroterpes (Euthraulus), Cheumatopsyche thomasseti, Amphipsyche scottae, Flatworms, Stenelmis thusa, Chironomids, Nychia marshalli, Baetis bellus, Baetis gaucus, Cloeon africanum, Caridina nilotica, Macronema capense. Afronurus, Species diversity.

A study has been conducted on the effects of pollution on the composition of fauna of the rivers and streams in the Vaal Dam (South Africa) catchment. Six sampling stations located in the un-stable depositing zone served as the sites of collection and monitoring of fauna as well as for chemi-cal analysis of the water. The animals found were compared with animals in the same biotopes of natural waterways of the area. It was obvious that in contaminated rivers there were generally less diversity in the fauna, reduced numbers of some species but large growths in others, and large numbers of cladocerans and copepods. Effluent effects were attributed more to nutrient supply than to toxicity; changes in the 'marginal vegetation' fauna were less than in 'stones-in-current' fauna, suggesting a greater tolerance of the former to a wider range of ecological conditions. Species suc-cess was still largely dependent upon food chain position and biotope roles. (Mackan-Battelle) W72-12726

MODELS OF ION AND SUBSTRATE COTRANSPORT AND THE EFFECT OF THE

Michigan Univ., Ann Arbor. Dept. of Physiology; Michigan Univ., Ann Arbor. Medical School; and Michigan Univ., Ann Arbor. Medical School; and Michigan Univ., Ann Arbor. Dept. of Biostatistics. For primary bibliographic entry see Field 05B. W72-12727

ALGAL GROWTH POTENTIAL TEST IM-PROVES SEWAGE EFFLUENT CONTROL, Uppsala Univ., (Sweden). Inst. of Physiological

Bolany. C. Forsberg, and A. Forsberg. AMBIO, Vol 1, No 1, p 26-29, February 1972. 2

Descriptors: *Sewage treatment, *Water quality control, *Monitoring, *Bioindicators, Sewage effuents, Testing, Cultures, Water pollution treatment, Waste dilution, Plant growth, Growth rates, Scenedesmus, Euglena, Efficiencies, Water pollu-tion effects, Nutrients. Identifiers: *Algal growth potential, Euglena

Identifiers: "Algal growth potential, Euglena gracilis, Ankistrodesmus falcatus, Scenedsmus quadricauda, Selenastrum capricornutum, Sample preparation, Occystis submarina var. variabilis, Ocystis submarina.

The algal growth potential (AGP) test is employed at several chemical treatment plants in Sweden to increase the efficiency of sewage treatment. Five-ml samples of sewage effluent are collected in small plastic tubes, frozen and taken to the laboratory where an autodiluter adds the effluent to a dard recipient solution containing 5 test algal species: Euglena gracilis, Ankistrodesmus fal-catus, Oocystis submarina var. variabilis, Scenedesmus quadricauda, Selenastrum capricor-Scenedesmus quadricauda, Selenastrum capricor-nutum, all of which were chosen because they flourish in dilute sewage. The resulting volume (2.5 ml) of the effluent in standard solution represents a 2.5 percent concentration. The algal volume produced by the nutrients (e.g., nitrogen, phosphorus) in the effluent is electronically deter-mined, and the AGP determined by taking the difference between maximal algal growth in the standard with and without the added effluent. Using this test the quality of the sewage treatment can be monitored and controlled by controlling the amount of nutrients in the sewage effluents. (Mackan-Battelle)

I

THE GRADUAL DESTRUCTION OF SWEDEN'S

LAKES, National Swedish Environment Protection Board, Stockholm. T Willen

AMBIO, Vol 1, No 1, p 6-14, February 1972. 9 fig,

Descriptors: *Lakes, *Water pollution effects, *Limnology, Water pollution, Water pollution sources, Sewage, Industrial wastes, Bioindicators, **Sumotogy, water polution, water polutionsources, Sewage, Industrial wastes, Bioindicators, Chemical properties, Physical properties, Phytoplankton, Zooplankton, Chlorophyta, Diatoms, Cyanophyta, Benthic fauna, Aquatic animals, Invertebrates, Aquatic algae, Aerial photography, Phosphorus, Nitrates, Nitrogen, *Eutrophication, Hydrogen ion concentration, Nutrients, Chlorophyll, Pikes, Perches, Physicochemical properties, Trout, Salmon, Freshwater fish, Anabaena, *Turbidity, Chrysophyta, Aquatic plants, Midges, Oligochaetes, Annelias, Oligotrophy, Bacteria. Identifiers: *Chlorophyll a, Macrophytes, *Sweden, Microcysis, Oscillatoria, Synura, Aroglena, Cryptophyceae, Pontoporeia affinis, Esox lucius, Perca fluviatilis, Salvelinus alpinus, Salmo trutta, Vendace, Salmon trout, Lota lota, Lake Malogen, Sweden, Char, Lucioperca lu-Lake Malogen, Sweden, Char, Lucioperca lu-cisperca, Burbot, Coregonus lavaretus, Coregonus albula, Whitefish, Branchiura sowerbyi, Pike perch, Lake Hjalmaren, Lake Vattern, Lake perch,

Detrimental changes are taking place in a group of 4 Swedish lakes caused by increasing sewage disposal and industrial pollution of their waters. Water samples collected 6 times a year and biological samples (bacteria, plankton, chlorophyll) collected results were the taket by the series. lected monthly were trested by physico-chemical methods for pH, organic matter, oxygen content, silica, turbidity, and conductivity. The flora and silica, turbidity, and conductivity. The flora and fauna were also studied. Long term studies reveal increasing deterioration around highly populated or industrial areas. Lake Malaren, taken as a representative lake, shows increasing turbidity, high concentrations of plant nutrients resulting in relatively high phytoplankton levels, and high volumes of zooplankton feeding or both. Although organism quantity appears to be increasing, quality and composition are not. Chlorophyll a studies show considerable yearly variation but appear to inversely correlate with turbidity levels. (Mackan-Battelle) W72-12729

UPSTREAM MOVEMENTS OF GAMMARUS PULEX PULEX (AMPHIPODA) IN A SOUTH SWEDISH STREAM, Lund Univ. (Sweden). Dept. of Animal Ecology.

L. Hultin.

Oikos, Vol 22, No 3, p 329-347, 1971. 19 fig, 5 tab, 28 ref.

Descriptors: *Movement, *Environmental effects, *Upstream, *Amphipoda, Crustaceans, Lotic environment, Currents, Flow, Velocity, Water temperature, Light, Diel migration, Biorhythms, Seasonal, Diurnal distribution, Water levels, Precipitation (Atmospheric), Sampling. Identifiers: *Gammarus pulex pulex, Rheotaxis, Macroinvertebrates, *Sweden.

A study was made of the environmental influences affecting upstream movements of lotic organisms, as represented by Gammarus pulex pulex. Upas represented by Gammarus pulses, pulses. Original stream-moving amphipods were continuously trapped by allowing stream water to trickle over a glass sheet sloping down into a water tank. Water temperature, precipitation, light periods, water level and water velocities were all measured and recorded as physical factors affecting the collec-tion. From March 1968 through May 1969 approxi-mately 150,000 specimens greater than 3 mm in size were captured in 2-hr catch intervals. It was discovered that upstream movements reached maximums in June and July with a minimum in March. These findings correlate well with seasonal

variations of precipitation, water level, and temvariations of precipitation, water level, and tem-perature. Activity changes due to precipitation and water levels appear related to sensitivity to water current fluctuations resulting in positive rheotaxis sing velocities. Diel activity patterns were affected by light and temperature variations with activities being limited mostly to the dark in winter and light in summer months. (Mackan-Battelle) W72-12732

AUTOANTAGONISM, HETEROANTAGONISM AND OTHER CONSEQUENCES OF THE EXCRETIONS OF ALGAE FROM FRESH OR THERMAL WATER, (AUTO., HETEROAN-TAGONISME ET AUTRES CONSEQUENCES DES EXCRETIONS D'ALGUES D'EAU DOUCE

OU THERMALE), Centre National de la Recherche Scientifique, Paris (France). Laboratoire de Cytologie et de Cytophysiologie de la Photosynthese. M. Tassigny, and M. Lefevre. Internationale Vereinigung Fur Theoretische Und Angewandte Limnologie, Mitteilungen No 19, p 26-38, November 1971. 6 fig, 4 tab, 39 ref.

Descriptors: *Aquatic algae, *Competition, *Nutrients, *Growth rates, *Inhibition, Fungi, Thermal springs, Cyanophyta, Bacteria, Ecology, Water pollution effects.

Identifiers: *Excretory products, *Autoantagonism, *Heteroantagonism, Axenic cultures, Excretory absorber products, and the programmer of the control of the

Excretion, Aphanizomenon gracile.

Different species of algae compete directly for nutrients, or indirectly by the production of sub-stances that inhibit the growth of competitors (heteroantagonism). Lefevre also recognizes au-cies becomes particularly abundant, other species become scarce. When the abundant species declines, the others resume active multiplication. Experimentally it was shown that species cultured in the water feeding a certain canal flourished, whereas those cultured in filtered water from the whereas those churter in interest water from the canal, where there was a large population of Aphanizomenon gracile, did not. Bacteria and fungi were eliminated in a dense population of an alga, and heteroantagonism was demonstrated in the laboratory with strains cultured free of bac-teria and fungi. The substances produced by some species occasionally stimulate the growth of others. The effect of one species upon another va-ries according to the conditions of the medium. (Holoman-Battelle) W72-12734

ACTION OF CALCIUM ON THE GROWTH OF AXENIC DESMIDS, (ACTION DU CALCIUM SUR LA CROISSANCE DE DESMIDIEES AX-ENIQUES), Centre National de la Recherche Scientifique,

Paris (France). Laboratoire de Cytologie et de Cytophysiologie de la Photosynthese.

Cytophysiologie de la Photosynthese. M. Tassigny. Internationale Vereinigung Fur Theoretische Und Angewandte Limnologie, Mitteilungen No 19, p 292-313, November 1971. 9 fig, 3 tab, 31 ref.

Descriptors: *Calcium, *Growth rates, *Cultures, *Aquatic algae, Chlorophyta, Inhibitors, Water pollution effects, Environmental effects, Competition, Aquatic populations, Nutrients, Nutrient requirements.

Identifiers: *Desmids, *Axenic cultures, Culturing techniques, Staurastrum paradoxum, Staurastrum sebaldii var. ornatum, Micrasterias crux-melitensis, Closterium strigosum, Culture media

In order to study the effect of calcium on the growth of pure cultures, experiments were per-

formed in a medium buffered with sodium phosphate to prevent excessive changes in pH and 300 mg/l potassium nitrate was added to the culture medium to maintain growth. Staurastrum paradoxum, which was taken originally from a calcium-rich polluted pond, grew equally well in all four concentrations of calcium used. Populations of three other species tested increased more slowly the higher the concentration of calcium in the culture medium, though the effect on each was not identical. S. sebaldii var. ornatum grew slowly in all media; the rate at which the population in-creased was depressed by calcium, though the total number attained varied less than did that of some other species. Calcium not only depresses the time between divisions of Micrasterias cruxmelitensis but reduces markedly the final numbers attained. Closterium strigosum differs from Micrasterias mainly in that 13.5 mg/l is the concen-tration below which effect on the final size of the population is slight. When M. crus-melitensis and S. sebaldii var. ornatum are cultured together in 17.1 mg/l Ca, the proportion of Staurastrum falls at first because it takes longer to adapt to the new conditions of the culture medium. At Ca concentrations of less than 17.1 mg/l the rise in the proportion of Staurastrum takes place more slowly because competition with M. crux-melitensis is maximum. There is no heteroantagonistic reaction of either to the other, though this appears to be the factor inhibiting the growth of M. crux-melitensis in culture with Closterium strigosum. (Holoman-Battelle) W72-12736

PHYTOPLANKTON OF TWO DANISH LAKES, WITH SPECIAL REFERENCE TO SEASONAL CYCLES OF THE NANNOPLANKTON, Copenhagen Univ. (Denmark). Inst. of Plant

Anatomy and Cytology.

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Internationale Vereinigung Fuer Theoretische Und Angewandte Limnologie, Mitteilungen No 19, p 253-265, November 1971. 12 fig, 15 ref.

Descriptors: *Phytoplankton, *Nannoplankton, Lakes, *Seasonal, *Primary productivity, Aquatic algae, Zooplankton, Chrysophyta, Chlorophyta, Biomass, Pyrrophyta, Spring, Summer, Autumn, Sampling, Plankton nets, Diatoms, Food chains, Anabaena, Scenedesmus, Seasonal, Dinoflagel-lates.

Identifiers: Lake Esrom, Tystrup Lake, Bavelse Lake, Cryptophyceae, *Denmark, Cyclotella comta, Stephanodiscus hantzschii, Aphanizomenon flos-aquae, Chroomonas acuta, Melosira granulata, Ceratium, Microcystis, Rhodomonas minuta, Asterionella formosa, Stephanodiscus astrea, Ankistrodesmus, Chrysococcus minutus, Dictyosphaerium, Lagerheimia.

The phytoplankton of Tystrup-Bavelse Lakes and Lake Esrom (Denmark) was examined in relationship to composition, quantity, and seasonal cycles of nannoplankton. For most of the year, about 80 percent of the total cell number was nannoplankton. In the Tystrup-Bavelse Lakes diatoms were dominant in spring, Chlorophyceae in summer. and Cryptophyceae in autumn and winter. In Lake Esrom, Chrysophyceae and Chlorophyceae were dominant in winter and spring, Cryptophyceae in summer and autumn. Nannoplankton constituted 25 percent of the phytoplankton biomass in both lakes with a vernal maximum (50-80 percent). The seasonal cycles of nannoplarkton biomass were due primarily to diatoms. Biomass values were calculated from volume estimations of each species concerned. Results were expressed in one million cubic microns/ml, with values being transformed into weight values, mg/l. (Snyder-Battelle) W72-12738 MINERAL NUTRITION OF PLANKTONIC ALGAE: SOME CONSIDERATIONS, SOME EXPERIMENTS,
Kohlenstoffbiologische Forschungsstation, Dortmund (West Germany).
C. J. Soeder, H. Muller, H. D. Payer, and H.

Studie. Internationale Vereinigung Fur Theoretische Und Angewandte Limnologie, Mitteilungen No 19, p 39-58, November 1971. 6 fig, 5 tab, 53 ref.

Descriptors: *Mineralogy, *Nutrient requirements, *Phytoplankton, *Aquatic algae, Cultures, Phosphates, Nitrates, Nutrients, Salts, Trace elements, Light intensity, Scenedesmus, Chlorella, Growth rates, Resistance, Phosphorus, Iron, Manganese, Zinc, Nickel, Cobalt, Copper sulfate, Heavy metals, Metals, Sulfates.

Heavy metals, Metals, Sulfates.
Identifiers: "Chlorella fusca, "Scenedemus acutus var alternans, "Nitzschia actinastroides, "Staurastrum pingue, Scenedesmus quadricauda, Chlorella pyrenoidosa, Lithium chloride, Lithium, Asterionella formosa, Asterionella japonica, Staurastrum paradoxium, Culture media, Zinc sulfate, Manganese chloride, Nickel sulfate, Cobalt sulfate, Potassium bromide.

Several aspects of mineral nutrition in planktonic algae are compared based on both a literature review and several experiments. Upper limits of review and several experiments. Upper limits of nutrient concentrations representing the nutrient concentration tolerance were established for each of four organisms: Chlorella fusca, Scenedesmus acutus var. alternans, Nitzschia actinastroides, and Staurastrum pingue. From these experiments it was tentatively concluded that the relative salt tolerance of freshwater algae is inversely proportional to the growth rate which is attained unless the salt concentration becomes surrecontinual. The the salt concentration becomes supraoptimal. The relativity of the optimum of nutrient concentrations was also evident in studies on trace element dosage. Suspension density was found to influence optimal trace element concentrations, the average requirements of the dense cultures being higher than these of the more dilute synchronous cultures. A lengthy discussion on the role of phosphate is included. (Mortland-Battelle) W72-12739

CULTIVATION AND GROWTH OF TWO PLANKTONIC OSCILLATORIA SPECIES, Max-Planck-Institut fuer Limnologie zu Ploen (West Germany). M. E. Meffert.

M. E. Mettert. Internationale Vereinigung Fur Theoretische Und Angewandte Limnologie, Mitteilungen No 19, p 189-205, November 1971. 11 fig, 3 tab, 19 ref.

Descriptors: *Cultures, *Growth rates, *Cyanophyta, Light, Thermocline, Carbon radioisotopes, Eutrophication, Pigments, Nutrient requirements, Limiting factors, Chlorophyll, Phytoplankton, Behavior.

Identifiers: *Oscillatoria rubescens, Culture media, Morphology, Phycobilins, *Oscillatoria redekei, Plusssee Lake, C-14, Assimilation.

Samples of Oscillatoria rubescens and O. redekei were isolated from the thermocline of Plusssee (a small eutrophic lake) and cultured to study the growth and behavior of these two species. Suspensions of O. rubescens were cultured in daily shaken Erlenmeyer flasks and in aerated gaswashing-bottles at 400-1400 Lux and 20C. O. washing-bottees at 400-100 Lux and 20c. Tredekei was cultivated in the same type of apparatus as well as in flow culture at light intensities of 400-5000 Lux and at 25C. Extinction of suspensions was measured at 436, 546, 623, and 750 nm. Other determinations include: (1) dry-weight, (2) trichome counts and C-14-fixation in O. ru-bescens, (3) cell counts/trichome and phycobilin measurements in O. redekei, and (4) pigmentation via spectral absorption. The number of trichomes was found to vary according to culture conditions and physiological stage of the algae. High assimila-tion rates were achieved in cultures of O. rubescens with a concentration of dry substance below 200 mg/l; growth rates decreased above 200 mg/l. In O. redekei cultures, growth was seemingly directly proportional to nutrient concentration. Both Oscillatoria species vary their color at dif-ferent cultivation conditions. (Snyder-Battelle) W72-12740

THE USE OF BLUEGILL BREATHING TO DE-

THE USE OF BLUEGARD STATES AND STATES.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 05A. W72-12741

THE USE OF FISH MOVEMENT PATTERNS TO MONITOR ZINC, Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies. J. Cairns, Jr., and W. T. Waller. Copy available from GPO Sup Doc, \$0.65; microfiche from NTIS as PB-211 333, \$0.95. Environmental Protection Agency Water Pollution Control Research Series, December 1971. 55 p, 1 fig, 19 tab, 26 ref. EPA Program 18050 EDP 12/71.

Descriptors: *Zinc, *Monitoring, *Toxicity, *Movement, *Fish physiology, *Fish behavior, Water pollution effects, Fry, Fish eggs, Growth stages, Fish reproduction, Pollutants, Growth rates, Mortality, Freshwater fish, Lethal limit, Shiners, Carp, Sunfishes, Heavy metals, Bioas-

Identifiers: Lepomis macrochirus, Notemigonus crysoleucas, Carassius auratus, Goldfish, Atomic absorption spectrophotometry.

A continuous monitoring system, consisting of an apparatus to detect light beam interruptions as a sign of aberrations in fish movement patterns, has been used to stidy the effects of fish exposure to lethal and sublethal concentrations of zinc. In addition lethal and sublethal concentrations of zinc. In addition to the exposure monitoring, the growth and reproductive success of exposed bluegill (Lepomis macrochirus) were studied. In the movement tests, Notemigonus crysoleucas and Carassius auratus were exposed to 2.94-3.64 mg/l zinc ions as zinc sulfate for 96 hrs. The light system detected premortal movement aberrations allowing for survival of test fish by condition reversal. Analysis of LD50 levels was accomplished and recorded by atomic absorption spectrophotometry twice daily. Growth and reproduction tests involved exposure of one male and 3 females to Zn concentrations about equal to 0.1-0.01 of the lowest concentration detected by the monitoring tests. Eggs were colabout equal to 1-0-01 of the lowest concentration detected by the monitoring tests. Eggs were collected and hatched separately. Concentrations of one-tenth the lowest zinc concentrations eliminated reproduction in the bluegills. (See also W72-12741) (Snyder-Battelle) W72-12742

A QUALITATIVE AND QUANTITATIVE STUDY OF PLASTOQUINONE A IN TWO THERMOPHILIC BLUE-GREEN ALGAE, Montana Univ., Missoula. Dept. of Botany. For primary bibliographic entry see Field 05A. W72-12748

ORGANIC EXCRETION BY DUNALIELLA ORGANIC EXCRETION BY DUNALIBLEA TERTIOLECTA, Duke Univ., Beaufort, N.C. Marine Lab. S. A. Huntsman. Journal of Phycology, Vol 8, No 1, p 59-63, March 1972. 3 fig, 2 tab, 24 ref.

Descriptors: *Carbohydrates, *Organic compounds, Cultures, Chlorophyta, Protozoa, Radioactivity techniques, Radioisotopes, Nitrates, Ions, Light, Nutrient requirements, Colorimetry, Environmental effects.

Identifiers: *Flagellates, *Excretion, *Dunaliella tertiolecta, Culture media, Enrichment media, Excretory products, Liquid scintillation.

Group 5C-Effects of Pollution

The effects of some environmental and physiologi-cal conditions on organic excretion by Dunaliella tertiolecta were determined. Cultures were maintained in f/2 medium at 15C under fluorescent light on a 12-hr light-12-hr dark cycle. Samples used in on a 12-hr light-12-hr dark cycle. Samples used in the excretion studies were incubated in 12 ml vials with C-14-labeled sodium bicarbonate (50 microcuries/micromole at 12-16C). The cells were removed by filtration and counted with a liquid scintillation counter. Counting efficiency was determined by addition of an internal standard of C-14-labeled benzene. Dissolved reducing car-bohydrates were measured colorimetrically and dichromatic readings (485-520 millimicrons) were used to counteract interference from nitrate ions in the medium. The results indicated that in healthy cultures, percent excretion was related to cell density but independent of light and precondi-tioning of the medium. Excretion was lower in nutrient-limited culture than in an enriched medium, and in both cases was minimal during logarithmic growth. Increases in dissolved carbohydrate during stationary phase represented an accumulation of high molecular weight compounds. The general composition of labeled excretory products was similar in both actively growing and stationary cultures. The data suggest that excretion may involve different processes at high and low cell densities. (Snyder-Battelle) W72-12750

THE COMPARATIVE EFFECTS OF CS AND VARIOUS POLLUTANTS ON FRESH WATER PHYTOPLANKTON COLONIES OF WOLFFIA PAPULIFERA THOMPSON,

Edgewood Arsenal, Md. E. G. Worthley, and C. D. Schott.

Available from the National Technical Informa-tion Service as AD-736 336, \$3.00 in paper copy, \$0.95 in microfiche. Report No EATR 4595, December 1971. 31 p, 14 fig, 3 tab, 17 ref.

Descriptors: *Water pollution effects, *Phytotox-Descriptors: "Water pollution effects, "Phytotoxicity, "Pesticide toxicity, "Phytoplankton, "Organic pesticides, DDT, Aldrin, Dieldrin, 2 4-D, Toxicity, Lethal limit, Cultures, Growth rates, Bioassay, Chlorinated hydrocarbon pesticides, Organophosphorus pesticides, Cultures, Inhibitors, Carbamate pesticides, Diazinon.

Identifiers: "Malathion, "CS, Sevin, Indole acetic "Welffie annulifier, Terestoenciett, Count.

acid, *Wolffia papulifera, Teratogenicity, Counting, Biological samples, Sensitivity.

Colonies of Wolffia papulifera were exposed to varying concentrations of CS, DDT, aldrin, dieldrin, malathion, diazinon, sevin, 2,4-D, and indole acetic acid (IAA) and the effects observed. Wolfflasks containing 40 ml of Hutner's medium to which were added pesticide concentrations of 0.01, 0.1, 1, 5, 10, 20, 50, 100, and 1000 ppm. The cultures were checked daily for increase or cultures were checked daily for increase or decrease in numbers, for abnormal growth, and for death. Concentrations of 1000 ppm of all compounds killed all Wolffia; at 100 ppm, only CS, DDT, malathion, diazinon, and IAA killed the entire colony. The lowest dosage that produced some abnormal effect was 10 ppm of CS, DDT, and IAA; 5 ppm of dieldrin, diazinon, and sevin; 1 ppm of aldrin and malathion, and 0.1 ppm 2,4-D. Most concentrations resulted in decreased growth rates. concentrations resulted in decreased growth rates. However, 1 and 5 ppm of aldrin, 5 ppm of dieldrin, and 5 and 10 ppm of diazinon caused a significant increase in growth rates. (Mortland-Battelle) W72-12751

DISTRIBUTION PATTERNS OF FIVE SELECTED GASTROPODS SPECIES FROM MCCARGO LAKE, Kansas State Univ., Manhattan. T. J. Horst, and R. R. Costa. Nautilus, Vol 85, No 2, p 38-43, 1971, Illus. Identifiers: Depth, *Distribution patterns, Florida, *Gastropods, Lakes, Light, McCargo Lake, Oxygen, Species, Temperature, Turbidity, Hydrogen ion concentration.

The south shore population was significantly dif-ferent from that on north shore, but no difference was found between east and west shores. Gastropod distribution is related to depth, tempera-ture, O2, pH, H2S, light, and turbidity from sam-ples taken at 20 stations, 8 of which yielded specimens.--Copyright 1972, Biological Abstracts, Inc. W72-12786

CHRONIC EFFECT OF FERRIC HYDROXIDE ON CERTAIN SPECIES OF AQUATIC ANIMALS,

Pittsburgh Univ., Pa. Graduate School of Public Health J. L. Sykora, E. J. Smith, M. A. Shapiro, and M.

In: Proceedings, 4th Symposium on Coal Mine Drainage Research, Mellon Institute, April 26-27, 1972. Pittsburgh, p 347-369. 19 tab, 30 ref. EPA

Descriptors: *Bioassay, *Iron compounds, *Acid mine water, *Aquatic animals, *Minnows, *Brook trout, *Fish eggs, *Fry, *Caddisflies, *Aquatic insects, Animal growth, Toxicity, Water pollution effects, Coldwater fish, Growth rates.

Freshwater shrimp, Growth rates, Colowar Resp., Identifiers: "Fathead minnows, Pimephales spp., Freshwater shrimp, Gammarus spp., Caddisfly larvae, Cheumatopsyche, Constant flow apparatus, Proportional dilution, Suspended ferric hydroxide.

Experiments to determine the chronic toxicity of ferric hydroxide to fathead minnows, brook trout, freshwater shrimp, and caddisfly larvae were conducted in a flow-through system using a modified proportional diluter. Brook trout kept for over ayear showed a definite trend to slower growth in increasing concentrations of Fe (OH)3. Egg viability was high in all concentrations except 50 mg/l. Fathead minnows held a full year in suspensions of Fe (OH)3 showed a decrease in growth and an increase in mortality with increase of iron. The highest concentration of suspended iron which does not affect growth and mortality was below 12 mg Fe/l. No effect on egg hatchability up to 50 mg Fe/l was found. Caddisfly larvae were more tolerant to Fe than were young Gammarus. The study indicates that the most important effect of suspended iron on aquatic fauna is physical, producing high turbidities which inhibit fish feeding and exert some effect on the eggs and freshly hatched fry in low concentrations. (Katz-Washington) W72-12790

TEMPERATURE ACCLIMATION IN THE NER-VOUS SYSTEM OF THE BROWN BULLHEAD (ICTALURUS NEBULOSUS),

Massachusetts Univ., Amherst. Dept. of Zoology. E. L. Bass.

Comparative Biochemistry and Physiology, Vol 40A, p 833-849, 1971. 9 fig, 9 tab, 36 ref.

Descriptors: *Fish physiology, *Water tempera-Descriptors: *Fish physiology, water tempera-ture, *Compensation, Temperature, *Bullheads, Biochemistry, *Thermal pollution. Identifiers: *Acclimation, *Gustatory response, Central nervous system, Feeding, Feeding reflex, *Ictalurus nebulosus.

The gustatory response of the brown bullhead was used as an indicator system for assessing the nature and location of temperature acclimation in the nervous system. Complete acclimation was found to occur in the brains of cold-acclimated but not warm-acclimated animals. No acclimatory response was found in either the peripheral sensory nerves or the spinal portion of the reflex pathway. Data support the theory that the synapse is the primary locus of acclimatory responses although the actual mechanism of compensation remains unknown. (Svensson-Washington) W72-12791

THE EFFECT OF CHINA CLAY ON THE SEDI-MENTS OF ST AUSTELL AND MEVAGISSEY

Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab. J. E. Portmann.

Journal of the Marine Biological Association of the United Kingdom, Vol 50, p 577-591, 1970. 6 fig. 1 tab. 9 ref.

Descriptors: *Industrial wastes, *Sediments, *Clays, *Water pollution sources, Bays, Particle size, Surveys, Water pollution effects. Identifiers: *China clay wastes, Size analysis, *St Austell Bay, *Mevagissey Bay.

Wastes from the china-clay industry are discharged in large quantities each year to Mevagissey and St. Austell Bays. The effect that these discharges have had on the sediments of these two bays was studied. By comparison with the natural sediments of Veryan Bay to the west of Dodman Point it was possible to assess what those of the bays had been before the discharges commenced and to what extent these had been altered by the china-clay waste. An attempt has been made to assess the quantity of china-clay residues present on the sea bed of the two bays and to relate this to the total estimated quantities discharged by the china-clay industry. The surveys established that approximated two-thirds of the sediments were made up to a greater or lesser extent of china-clay waste. This waste completely covers the sea bed of one-sixth of the area surveyed. Lack of transport is probably due to very weak currents and long periods of slack water. (Svensson-Washington) W72-12792

FISH AND FISHERIES IN THE CONTEXT OF ENVIRONMENTAL CONCERN, Food and Agriculture Organization of the United

Nations, Rome (Italy). Dept. of Fisheries.
H. A. Regier, and D. W. Kelley.
FAO Fisheries Technical Paper No. 110
FIR/T110, Fisheries and Environment, 1971. 21 p.

Descriptors: *Fisheries, *Fish mana *Water management, *Water uti *Water management, *Water utilization, *Reviews, *Ecology, *Water pollution, *Water pollution control, Commercial fishing, Fish populations, Fish conservation, Water quality, California, Lake Erie, Environmental control, Aquatic environment, Exploitation, Water resources, Water pollution sources, Water pollution effects. Identifiers: Proposed management, Pollution ex-

An overview of the effects of toxic pollution, plant nutrient enrichment, and fisheries exploitation on the detailed nature of ecological diversity and stability of the aquatic community is presented. Two examples of complex water pollution problems are given. There is a pressing challenge for humanity to define and work for its long-term objectives with respect to the aquatic environment and its communities. Svensson-Washington

GROWTH AND CONDITION OF FISHES IN NORTHERN DONETS AND ITS TRIBUTARY AIDAR IN THE REGION INTO WHICH WARMED WATER FROM THE LUHANSK POWER STATION ARE DISCHARGED, Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.

A. Y. Shcherbukha. Vopr Ikhtiol. Vol 11, No 2, p 290-302. 1971. Illus. Identifiers: *Water pollution effects, *Thermal pollution, Discharge (Water), Abramis brama, Aidar tributary, Blicca bjoerkna, Chondrostoma nasus variabile, Donets, Esox lucius, Fishes, Growth, Luhansk, Mortality, Perca fluviatilis, Power plants, Rutilus rutilus, USSR. Studies were conducted on the rate of growth and the state of fish in northern Donets and its tributary Aidar under the influence of the warm waters discharged by the Luhansk Power Station. The studies were deemed especially pertinent in view of the fact that the capacity of the power station is expected to be increased. Studies on the development of Abramis brama, Blicca bjoerkna, Chondrostoma nasus variabile, Rutilus rutilus, Perca fluviatilis, and Esox lucius, showed, that, with the possible exception of the chondrostomes, the increased temperatures of the water had no significant effect on the sexual development of the fish. However, maturation of the eggs seemed to occur However, maturation of the eggs seemed to occur more rapidly as indicated by earlier spawning in the warmer waters. Although the temperatures in the warmer waters. Although the temperatures in Aidar River may have been raised by 10C (usually 6-8C), and those of the Donets by 1-4C above the locks, no fish deaths were noted. However, fish deaths were noted in the cooling pond where the temperature frequently reached 40C and, therefore, the waters should be cooled before they are discharged into the cooling pond.—Copyright 1972, Biological Abstracts, Inc.
W72-12841

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METHEMOGLOBIN IN ERTHROCYTES OF

RAINBOW TROUT,
Alaska Univ., College. Inst. of Arctic Biology. J. N. Cameron.

J. N. Cameron. Comp Biochemi Physiol A Comp Physiol. Vol 40, No 3: p 743-749, 1971. Identifiers: "Fish physiology, Ascorbic acid, "Erythrocytes, "Hemoglobin, "Rainbow trout,

The proportion of Hb carried as oxidized (met-) Hb varied from 2.9% in a wild stock to 17% in a hatchery stock of rainbow trout. Hypoxia, anemia and the reticulocyte percentage (and consequently cell age) had little effect on the metHb content. Nitrates and nitrites in water had no significant long-term effect, but i.v. ascorbic acid tends to reduce metHb. The experiments revealed that litthe or no erythrocyte synthesis takes place in response to hypoxia.—Copyright 1972, Biological Abstracts, Inc. W72-12907

THE STRESS OF FORMALIN TREATMENTS IN RAINBOW TROUT (SALMO GAIRDNERI) AND COHO SALMON (ONCORHYNCHUS

Bureau of Sport Fisheries and Wildlife, Seattle, Wash, Western Fish Disease Lab.

G. Wedemeyer.
Journal of Fisheries Research Board of Canada,
Vol. 28, No. 12, p 1899-1904, December 1971. 9 fig,

Descriptors: *Rainbow trout, *Fish physiology, *Stress, Toxicity, Mortality, Lethal limit, Salmon, Vitamins, Metabolism, Oxygen, Carbon dioxide, Alkalinity, Ventilation, Animal pathology, Bioas-Alkalinity, Ventilation, Animal pathology, Bioassay, Hydrogen ion concentration, Consumptive use, Calcium, Chlorine, Anions, Cations, Bicarbonates, Juvenile fish, Water pollution effects. Identifiers: *Formalin, *Coho salmon, Salmo gairdneri, Oncorhynchus kisutch, Vitamin C, Plasma, Blood, Hemolysis, Bilirubinemia, Dyscrasia, Bilirubin, Gills, Kidneys, Liver, Tissue, Biological samples, Pituitary.

Changes in gill function, acid-base balance, and pituitary activation occurring during standard 200 ppm formalin treatments of juvenile rainbow trout ppm formalin treatments of juvenile rainbow trout and coho salmon were compared. Groups of fish were exposed to 200 or 400 ppm formalin in aerated water of 20 ppm hardness at 10 C. The fish, weighing 20-40 g, were generally exposed in groups of 50 with a fish to water ratio of 1 to 40. The fish were removed in groups of 5-10 at desired intervals and caudal arterial blood samples were taken to evaluate acid-base balance and gill, kidney, and liver function. This was done by measuring 02 consumption, plasma total carbon dioxide, HC03 and chlorine cations, calcium anions, biliru-bin, and whole blood pH. Anterior kidney Vitamin bin, and whole blood pH. Anterior kidney Vitamin C depletion was measured to evaluate pituitary-interrenal activation. Plasma anions and cations, carbon dioxide, and interrenal Vitamin C in the trout declined continuously and in proportion to exposure time. In salmon these parameters remained at initial levels. Blood pH and alkaline reserve regulation were also less affected in the salmon, particularly during prolonged exposure Oxygen consumption was depressed in both species. Significant bilirubinemia occurred in the trout but there was little hemolysis in either species. but there was little hemolysis in either species. (Mortland-Battelle) W72-12926

HEAT: A QUESTION OF LIFE-AND-DEATH.

Zool Revy. Vol 32, No 4, p 91-99. 1970. Illus. En-

glish summary. Identifiers: *Water pollution effects, *Thermal pollution, Effluents, Salmon, Trout, Cyanophyta.

An evaluation is made on the positive effects of warm water effluents on bodies of water. These inwarm water effluents on bodies of water. These in-clude stimulation of food organisms for commer-cial fish species such as salmon and trout, in-creased water movements including O2 transport and stimulated purification of rivers even during winter time. The stimulated production of un-desirable organisms such as blue-green algae and disturbance of migration routes of fish are also in-dicated.—Copyright 1972, Biological Abstracts, Inc. W72-12928

COMETABOLISM OF THE HERBICIDE, 2,3,6-TRICHLOROBENZOATE BY NATURAL MICROBIAL POPULATIONS, Bowling Green State Univ., Ohio. Dept. of Biolo-

gy. For primary bibliographic entry see Field 05B. W72-12935

BIOLOGICAL EFFECTS OF FATTY AL-COHOLS ON FRESHWATER ANIMALS (BIOLOGISCHE AUSWIRKUNGEN VON FET-TALKOHOLEN AUF SUBSSWASSERTIERE), Bundesforschungsanstalt fuer Fiscerhei, Hamburg (West Germany). Institut fuer Kuesten-und Bin-penfischeren.

nenfischerei. H. Mann.

Internationale Revue der Gesamten Hydrobiologie, Vol 56, No 4, p 599-607, 1971. 8

Descripiors: *Aquatic animals, *Water pollution effects, *Monomolecular films, *Evaporation control, Daphnia, Crustaceans, Copepods, Tubificids, Aquatic insects, Larvae, Poisons, Freshwater fish, Air-water interfaces, Water quality control, Hexadecanol, Physical properties, Surface tension, Water properties, Rainbow trout. Identifiers: *Fatty alcohols, Lebistes reticulatus, Gerris, Lebistes.

A monomolecular layer of fatty alcohols was spread over a water surface to determine if such anti-evaporation techniques have biological effects on freshwater animals. After an eight-day observation period, copepods, Daphnia, and tubificids showed no signs of damage. Lebistes reticulatus and Salmo gairdneri, held in a tank and fed with live or dried food passed through the fatty alcohol layer, accepted the food and showed no signs of disease or poisoning. Insects or insect larvae, however, which normally move, breathe or hatch on the surface could not overcome the decrease in surface pressure and drowned. The normal surface pressure of the water/air interface was reduced from 75 dynes/cm at 10 C to 40 dynes/cm after the addition of fatty alcohols. (Snyder-Battelle)

PHYSIOLOGICAL INVESTIGATIONS ON THE TOLERANCE OF FUCUS VIRSOIDES (DON) J. AG., (PHYSIOLOGISCHE UNTERSUCHUNGEN UBER DIE TOLERANZ VON FUCUS VIRSOIDES (DON) J. AG), Zavod za Biologiju Mora, Rovinj (Yugoslavia). F. Gessner, and L. Hammer. Internationale Revie der Gesamten Hydrobiologie, Vol 56, No 4, p 581-597, 1971. 9 fig, 7 tab, 16 ref.

Descriptors: *Marine algae, *Kelps, *Physiological ecology, Phaeophyta, Standing crops, Resistance, Primary productivity, Biomass, Anaerobic conditions, Water temperature, Chlorides, Photosynthesis, Littoral, Respiration, Plant physiology, Bicarbonates, Water pollution effects. Identifiers: *Fucus virsoides, Fucus spiralis, Mediterranean Sea.

The work of Linardic is reported, who proved that Fucus virsoides, through isolation has become a separate species, endemic to the Mediterranean; it is possibly a descendant of Fucus spiralis. The ecological habitat conditions are analyzed and it is noted that Fucus virsoides, avoids very exposed coasts. According to Linardic, the main growth periods are winter and spring; when compared to northern littoral algal populations, 'standing crop' and primary production seem to be very limited. The temperature limit for photosynthesis at 12 hours exposure is about 34C. After exposure to temperatures a few degrees above zero, photosynthesis remains normal, but Fucus does not tolerate freezing. In respect to temperature, respiration proves to be more tolerant than photosynthesis remains normal, but Pucus does not tolerate freezing. In respect to temperature, respiration proves to be more tolerant than photosynthesis; however, exposure to sun throughout the day does not lead to a reduction in photosynthesis but a rise in the bicarbonate content causes a mainfold increase in rate. Air-dry conditions can be tolerated for 2-3 days without damage; however, subsequent processes in Fucus exposed to dryness lead to the death of the algae. This was proved by the increase of Cl-loss and the Winkler-titration. Fucus virsoides can tolerate 1 week in distilled water almost without damage and is amazingly tolerant to oxygen-free conditions (anaerobiosis). Photosynthesis does not decrease until several days in anaerobic conditions; in contrast, respiration remains unaffected. Fucus virsoides is not an indicator for minimal effects of polluted water; however, it disappears rapidly after strong pollution of coastal areas. (In German) (Holoman-Battelle)

EUTROPHICATION OF SURFACE WATERS-LAKE TAHOE.
Lake Tahoe Area Council, South Lake Tahoe,

Copy available from GPO Sup Doc EP2.10:16010 DJW 05/71, \$1.25; microfiche from NTIS as PB-211 460, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, May 1971, 154 p. 17 fig., 45 tab., 25 ref., 5 append. EPA Program 16010 DJW 05/71.

Descriptors: *Water pollution sources, *Eutrophication, *Lakes, Sewage effluents, Seepage, Septic tanks, Bioassay, Chemical analyses, Nitrogen, Nutrients, Surface waters, Algae, Chemical properties, Landfills, Percolation, Drainage, Runoff, Precipitation (Atmospheric). Identifiers: *Lake Tahoe (Calif.).

A survey was made of nutrient and other chemical constituents of surface waters from developed and undeveloped land areas, sewage effluents, seepage from septic tank percolation system and seepage from septic tank percolation system and refuse fills, drainage from swamps, precipitation, and Lake Tahoe water. Algal growth stimulating potential of the samples were bioassayed with Selenastrum gracile as a test organism. Algal response to nutrients was measured by maximum growth rate and maximum cell count in a 5-day growth period. Ponds simulating the shallow portions of the lake were used for continuous flow

Group 5C-Effects of Pollution

assay of the biomass of indigenous lake organisms produced by sewage effluent. Flask assays and chemical analyses were made over two years on three major creeks. Twenty-eight other cre precipitations were monitored by chemical analysis. Evaluating the eutrophication potential, Lake Tahoe is nitrogen sensitive and responds to it in proportion to its concentration. Creeks draining developed land carried twice the nitrogen as those draining relatively undisturbed watersheds. Human activity doubles nitrogen inflow to the lake. Exporting all sewage would remove 70% of the nitrogen. (Jones-Wisconsin)

ROLE OF BACTERIA IN THE NITROGEN CYCLE IN LAKES, Wisconsin Univ., Madison. Dept. of Bacteriology.

E. F. McCoy.

Copy available from GPO Sup Doc EP 2.10:16010

EHR 03/72, \$0.35; microfiche from NTIS as PB-211 461, \$0.95. Environmental Protection Agency, Water Pollution Control Series, March 1972. 23 p 3 fig, 2 tab, 8 ref. EPA Program 16010 EHR 03/72.

Descriptors: *Bacteria, *Nitrogen cycle, *Lakes, Fungi, Nitrification, Nitrates, Nitrites, Ammonifi-cation, Denitrification, Actinomycetes, Nitrogen fixation, Toxicity, Fish, Perches, Carp, Sticklebacks, Bullheads, Suckers, Eutrophication, Frogs, Minnows, Decomposing organic matter,

Identifiers: Autotrophic bacteria, Heterotrophic

Biological nitrification as contributing nitrite and nitrate to lakes and streams is explored by deter-mining: nitrifiers, growth sites and activity; denitrifying bacteria numbers and their potential activity as opposing nitrification; field data on nitrite-nitrogen and nitrate-nitrogen in terms of nitrifier and denitrifier populations. Biological nitrification, both heterotrophic and autotrophic, was demonstrated. Values for nitrate-nitrogen above 10 ppm were common; 30 to 60 ppm were found on beaches containing decomposing organic matter. At the same sites denitrifying bacteria were prevalent. More than 70% of 628 samples contained more than 10,000/ml. Even though opposing processes, nitrification and denitrification can coexist in close succession or in adjoining microhabitats. Field values for nitrate-nitrogen and nitrite-nitrogen vary considerably and must be viewed as net values at any given time. Thirteen species of fishes varied greatly in resistance to nitrite-nitrogen. Perch and brook sticklebacks were killed in 3 to 5 hours at 5 ppm. Carp and black bullheads tolerated 40 ppm two weeks and 100 ppm about 24 hours. Susceptibilities of others varied. Nitrite toxicity may influence fish species dominance in a eutrophic lake. (Jones-Wisconsin) W72-12956

EUTROPHICATION OF SURFACE WATERS-LAKE TAHOE INDIAN CREEK RESERVOIR.
Lake Tahoe Area Council, South Lake Tahoe,

Copy available from GPO Sup Doc EP 2.10:16010 DNY 07/71, \$1.25; microfiche from NTIS as PB-211 462, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, July 1971. 115 p. 25 fig, 12 tab, 20 ref, append. EPA Program 16010 DNY 07/71.

Descriptors: *Reservoirs, *Water reuse, *Water *Reclaimed water, *Self-purification, Aquatic life, Recreation, *Eutrophication, Waste water treatment, Phosphorus, Nitrogen, Productivity, Trophic level. Identifiers: *Indian Creek Reservoir (Calif), *Lake Tahoe (Calif-Nev), Nitrogen removal.

The water impounded at Indian Creek Reservoir was approximately one-third surface runoff and

direct precipitation and two-thirds reclaimed water exported from South Tahoe Public Utility District plant. During 1969 to 1971 field and laboratory studetermined the temporal changes and tionships between water quality characteristics of Indian Creek Reservoir and those of the reclaimed water. Reclaimed water contained 0.01 to 0.04 mg/l water. Reclaimed water contained 0.01 to 0.04 mg/l phosphorus and more than 15 mg/l ammonia. Initially the reservoir would not support fish life, but as the reservoir matured, ammonia levels declined to less tha 4 mg/l and by 1970 it was an excellent trout fishery. Approximately 70% of the ammonia nitrogen was lost to the atmosphere by nitrification-denitrification. Good biological productivity indicated access to other possphorus sources. indicated access to other phosphorus sources, probably runoff. Relative to conductivity and chemical components the water is of good irrigation quality. Bioassays showed growth stimulating ability of reservoir water to exceed that of reclaimed water. Various parameters showed that the reservoir responds to more complex factors than those measurable in the reclaimed waste water, raising the question of optimum water treatment for recreational impoundments. (Jones-Wisconsin) W72-12957

USE OF ALGAL ASSAYS IN STUDYING EUTROPHICATION PROBLEMS, National Environmental Research Center, Corvallis, Org. National Eutrophication Research Pro-

T. E. Maloney.
Preprint, presented at 6th International Water PolPreprint, Conference, Session 3, No. 6, lution Research Conference, Session 3, No. 6, Hall C, June 20, 1972, 10 p, 6 tab, 3 ref.

Descriptors: *Eutrophication, *Assay, *Algae, Analytical techniques, Waste water treatment, Nutrients, Nutrient requirements, Growth rates, Phosphorus, Nitrogen, *Regression analysis,

Variability. Identifiers: Dissolved phosphorus, *Algal assays,

The use of algal assays to assist in the solution of ne use of aigat assays to assist in the solution of practical eutrophication problems was illustrated. The Bottle Test assay, as developed by the National Eutrophication Research Program was utilized during these studies. Practical application of the assay procedure included assessment of affects of changes in waste treatment processes on receiving waters, identification of algal growthlimiting nutrients and assessment of receiving waters to determine their nutrient status and sen sitivity to change. A multiple regression analysis, using the various chemical parameters as the in pendent variables and the maximum algal yield as the dependent variable was run to determine the nutrient having the most influence on algal growth. Dissolved phosphorus alone explained 79.84 per-cent of the variability in algal growth in the samles, and the six nutrients only increased this by ples, and the six national 6.29%. (Galwardi-Texas) W72-12966

ELECTRIC POTENTIALS AND DOMESTIC WATER SUPPLIES, Washington State Univ., Pullman.

L. B. Craine, M. H. Ehlers, and D. K. Nelson. Agricultural Engineering, Vol 51, p 415-417, July 1970, 2 fig. 1 tab.

Descriptors: *Water supply, Agricultural engineering, *Cattle, Electrical grounding, Water consumption, Electrical networks, Electric cur-

Identifiers: *Electrical potential, Voltage.

Electric potentials on domestic water systems affected water consumption and productivity of cat-tle. The problem of annoying voltage resulted from a single-phase two-wire multiple-grounded system with primary distribution and secondary utilization neutrals solidly bonded together. The problem was solved by separation of grounded neutrals of the primary distribution system from the farm secondary system. An electrified fountain system was built to test effects of controlled voltages on animal water consumption. At current levels of 19 ma and at a level of 8 volts the cattle would not drink for an 8 hour period. (Galwardi-W72-12970

PROJECT HYPO,
Department of Energy, Mines and Resources,
Burlington (Ontario). Canada Centre for Inland

Waters; and Environmental Protection Agency, Fairview Park, Ohio. Ohio District Basin Office. Noel M. Burns, and C. Ross.
Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972. 182 p, 6 append

Descriptors: *Lake Erie, *Eutrophication, *Hypolimnion, *Dissolved oxygen, *Anaerobic conditions, Algae, Sediments, Oxygen demand, Phosphorus, Nitrogen, Nutrients, On-site data col-

Interdisciplinary findings and estimates resulting from Project HYPO, an investigation of the Central Basin of Lake Erie, lead to one definite con-clusion: Phosphorus input to Lake Erie must be reduced immediately; if this is done a rapid im-provement can be expected; if it is not done, the rate of deterioration will be much greater th has been in recent years. Contributions discuss in detail the effects of algae, causes and site of oxygen depletion, sediment oxygen demand, budget calculations, hypolimnion volume increase, up-welling of water masses, proximity of a process of continual self-fertilization, and phosphorus and nitrogen elimination from the lake system. Evidence is presented which suggests that 76% of the phosphorus and 57% of the nitrogen in algal material which sediments to the lake floor is retained there if oxic conditions are maintained in the overlying water. Approximately 80% of the phosphorus and 56% of the nitrogen loaded into Lake Erie from external sources will be removed from the water if oxygenated conditions are main-tained. Appendix I describes an automatic underwater camera system designed for use during this project and Appendix II describes a submersi-ble automatic dissolved oxygen-temperature moni-toring system. (See W72-12991 thru W72-12997) W72-12990

OXYGEN DEPLETION IN THE HYPOLIMNION

OF THE CENTRAL BASIN OF LAKE ERIE, 1929 TO 1970, Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland

Waters.
H. H. Dobson, and M. Gilbertson.
In: Project HYPO: Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972, p 3-8. 4 fig, 13 ref.

Descriptors: *Hypolimnion, *Lake Erie, Anaerobic conditions, Eutrophication, Dissolved oxygen, Phytoplankton, Nutrients, Thermocline, Stratification. Phosphates. Identifiers: *Oxygen depletion, *Lake Erie Cen-

tral Racin

Information from published and preliminary reports concerning oxygen values in the hypolim-nion of Lake Erie's Central Basin, lying between Burwell and Erie in the east and Pelee Point and Sandusky in the west, was studied. The oxygen concentration at the beginning of the stratified period had not changed in four decades. However, oxygen depletion rate has markedly increased and onset of deoxygenated conditions in

the bottom water occurs earlier. Deoxygenation of the unmixed bottom water of the hypolimnion has increased in the last two decades at the approximate annual rate of .075 mg/l per month/year. Since the duration of the stratification period is about 100 days, a critical depletion rate of 3.0 mg/l per month determines whether much of the basin will become deoxygenated before the autumnal overturn. It appears that this critical value occurred about 1960 and this is consistent with the increased incidence of zero values for dissolved oxygen in samples analyzed since that year. The main source of organic matter is detrital phytoplankton material, sedimented to the lake bottom where it is decomposed by bacteria. (See also W72-12990) (Jones-Wisconsin) W72-12991

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PHYSICAL PROCESSES AFFECTING THE HYPOLIMNION OF THE CENTRAL BASIN OF LAKE ERIE, Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters; and Environmental Protection Agency, Fairview Park, Ohio.
J. O. Blanton, and A. R. Winklhofer.
In: Project HYPO: Canada Centre for Inland Waters Paper No 6, and Environmental Protection

Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972, p 9-37. 22 fig, 4 tab, 9 ref.

Descriptors: *Hypolimnion, *Lake Erie, *Dis-solved oxygen, Temperature, Currents (Water), Winds, Thermocline, Algae, Sediments. Identifiers: *Lake Erie Central Basin, Pointe Pelee (Ontario), Oxygen depletion.

In situ automatic monitoring devices, existing land monitoring stations, and cruise sampling furnish data to determine relationship between dominant winds, dominant motions in the hypolimnion, and winds, dominant motions in the hypoilminon, and thermocline response to these motions. Hypolim-nion volume increases were explained by low wind energy periods followed by brief periods of high wind energy. This wind energy cycling does not necessarily occur annually. Hypoliminon oxygen entrainment from above would be minimal resultentrainment from above would be minimal result-ing in the hypolimnion becoming anoxic at an un-precedented rate under conditions of long duration high energy winds with few intervening calm periods. The net hypolimnion water movement is the result of the dominant southwest winds caus-ing the Canadian nearshore areas, east of Pointe Pelee, to be a potential staging area for profuse algal blooms due to accumulation of nutrient-rich anoxic water in upwelled areas. Dissolved oxygen depletion rates as determined, confirm the longdepletion rates as determined, confirm the long-term trend of increasing depletion rate. Measured hypolimnion dissolved oxygen fluctuations solely nypoinmino dissolved oxygen fluctuations solely attributable to algal presence were not detected. Sediment oxygen demand might account for the measured hypolimnion rate; however, due to the variety and complexity of the lake system, it cannot be assumed that this single parameter can define a situation. (See also W72-12990) (Jones-Wiccoscie) Wisconsin) W72-12992

AN INVESTIGATION OF DIFFUSION CHARACTERISTICS OF THE HYPOLIMNION OF LAKE ERIE,

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland

Waters.
C. R. Murthy.
In: Project HYPO: Canada Centre for Inland
Waters Paper No 6, and Environmental Protection
Agency Technical Report, TS-05-71-208-24,
February 1972, p 39-44. 6 fig, 1 tab.

Descriptors: *Lake Erie, *Hypolimnion, *Diffusion, Circulation, Dye dispersion, Thermocline, Tracking techniques, Rhodamine, Sewage disposal, Mixing.

Identifiers: Submarine outfalls.

A water soluble rhodamine B dye was released in August 1970 to study large scale diffusion characteristics of Lake Erie's hypolimnetic waters. During the 60-hour experiment, the vertical spread of the patch was restricted to the hypolimnion because of the strong thermocline; the horizontal spread was an order of magnitude less, corresponding eddy diffusivity two orders of magnitude less, and the observed peak concentration was two orders of magnitude greater compared to surface layer diffusion for comparable time scales. Results raise an important practical question in regard to the possibility of discharging effluents at lake bottom using offshore submarine outfalls. By discharging the effluents through an offshore outfall placed at the lake bottom, at some distance from shore, the entire water column is available for dispersing the effluents. But during summer the discharge is normally below the thermocline with very little transport and mixing. With shoreward transport of the concentrated submerged effluent field and the possibility of occasional upwellings, very high concentrations may be brought to the surface close to the shoreline. (See also W72-12990) (Auen-Wisconsin)

SEDIMENT OXYGEN DEMAND IN LAKE ERIE'S CENTRAL BASIN, 1970.
Environmental Protection Agency, Cincinnati, Ohio. Div. of Field Investigations.
A. M. Lucas, and N. A. Thomas.

A. M. Lucas, and N. A. Thomas. In: Project HYPO: Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972, p 45-50. 3 fig. 1 tab, 2 ref.

Descriptors: *Sediments, *Lake Erie, *Dissolved oxygen, Oxygen demand, Hypolimnion, Aquatic plants, Algae. piants, Aigae. Identifiers: Lake Erie Central Basin.

The biochemical and chemical oxygen demand in Lake Erie's Central Basin hypolimnetic waters was too small to explain the oxygen depletion rates; tests indicated that dissolved oxygen depletion was caused primarily by the oxygen demand of bottom sediments. Sediment oxygen demand rates were measured at five locations in June, August, and September 1970. The rates were determined from changes in the disadved oxygen conmined from changes in the dissolved oxygen con-centration of water sealed and circulated within black and clear plexiglass chambers imbedded in the lake bottom. Sediment oxygen demand rates recorded in June varied from 1.2 to 2.2 gm oxrecorded in June varied from 1.2 to 2.2 gm oxygen/sq m per day and were indicative of eutrophic conditions. Rates measured in August during daylight hours with a clear chamber were less than those measured at night with the clear chamber or during the day with the black chamber. Oxygen produced by algal photosynthetic activity on the lake bottom offset the sediment oxygen demand during part of the day resulting in daily SOD rates of 0.4 to 0.7 sm oxygen/sq mer day Rates. mand during parts the day resisting in day Syntages of 0.4 to 0.7 gm oxygen/sq m per day. Rates measured in September with oxygenated surface water trapped and carried to the bottom in the chambers ranged from 1.0 to 2.4 gm oxygen/sq m per day. (See also W72-12990) (Auen-Wisconsin) W72-12994

BIOLOGICAL STUDIES RELATED TO OXYGEN DEPLETION AND NUTRIENT REGENERATION PROCESSES IN THE LAKE ERIE CENTRAL BASIN, Environmental Protection Agency, Fairview Park,

Onio.
T. Braidech, P. Gehring, and C. Kleveno.
In: Project HYPO: Canada Centre for Inland
Waters Paper No 6, and Environmental Protection
Agency, Technical Report TS-05-71-208-24,
February 1972, p 51-70. 17 fig, 3 plates, 4 ref.

Descriptors: *Oxygen demand, *Anaerobic condi-tions, *Lake Erie, *Algae, *Benthic fauna, *Bot-tom sediments, *Hypolimnion, Phytoplankton, Light penetration, Dissolved oxygen, Bacteria,

Thermocline, Sediment-water interfaces, Chrysophyta, Chlorophyta, Cyanophyta, Biochemical oxygen demand. Identifiers: *Lake Erie Central Basin, Tribonema. Oedogonium, Anacystis, Ceratium, Cosmarium,

A comprehensive attempt was made to define phytoplankton conditions throughout the water column and on the sediments of Lake Erie Central Basin. Special techniques were employed to explain presence, origin, and viability of heretofore unobserved, apparently metabolizing algae. Tribonema and Oedogonium, deposited on the bottom, were the major source of organic carbon utilized in consumption of hypolimnetic oxygen as a result of bacterial activity at the water-sediment interface. The algae on the sediments maintain growth after light becomes limiting for other sedimental forms. The mixing of nutrient-rich hypolimnion water into the thermocline and lower repilimnion stimulated algal growth, primarily Anacystis, at these levels, particularly at stations cystis, at these levels, particularly at stations where dissolved oxygen depletion in the hypolimnion had been recorded. From approximately July 21 to August 10 there was maximum photosynthetic activity on the bottom resulting in photosynthetic activity on the bottom resulting in a reduced sediment oxygen demand. Increasing phytoplankton volumes in the overlying waters and the decreasing photoperiod reduced light on the bottom to biologically limiting levels in mid-August. Algae do contribute oxygen to the hypolimnion for a period of time; however, impact and magnitude of this contribution appears to be masked by a stronger oxygen demanding physical and chemical phenomena. (See also W72-12990) (Jones-Wisconsin) W72-12995

MICROBIOLOGICAL STUDIES RELATED TO OXYGEN DEPLETION AND NUTRIENT REGENERATION PROCESSES IN THE LAKE ERIE CENTRAL BASIN, Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland

Burlington (Ontario). Canada Centre for Inland Waters; and Environmental Protection Agency, Fairview Park, Ohio. Microbiology Lab. A. S. Menon, C. V. Marion, and A. N. Miller. In: Project HYPO: Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972, p 71-84. 10 fig. 4 tab, 17 ref.

Descriptors: *Dissolved oxygen. *Lake Erie, *Bacteria, *Sediment-water interfaces, *Hypolimoin, Nitrification, Algae, Thermocline, Anaerobic bacteria, Aerobic bacteria, Sulfur bacteria, Iron compounds. Identifiers: *Deoxygenation, *Nutrient regenera-tion, Lake Erie Central Basin.

This bacteriological study aimed to evaluate dis-tribution of bacterial densities and biotypes at the sediment-water interface and overlying waters in relation to time, chemical, physical, and biological data and to assess their role in overall oxygen data and to assess their role in overall oxygen depletion and nutrient regeneration processes in the hypolimnion of Lake Erie's Central Basin. Major site of intensive bacterial activity was the sediment-water interface. Organic deposits from algal rains and other sources, accumulated at the bottom, underwent bacterial decomposition resulting in oxygen depletion and formation of reduced products of low molecular weight. The reduced products were subsequently oxidized by chemoautotrophic bacteria at the sediment-water interface, or in the overlying waters, resulting in additional oxygen depletion. This process repeated itself after each algal rain causing further oxygenloss. Precipitation of particulate matter through the after each algal rain causing further oxygenloss. Precipitation of particulate matter through the hypolimnion from intermittent algal rains was primarily responsible for high bacterial densities in the hypolimnion because phytoplankton con-stituted a locus for bacterial attachment and produced soluble organic substrates for bacterial growth. A significant correlation was obtained between Desulfovibrio densities and degree of ox-

Group 5C-Effects of Pollution

ygen depletion. These factors strongly suggest that heterotrophic and chemoautotrophic bacteria are the principal factors in depleting oxygen. (See also W72-12990) (Jones-Wisconsin)

OXYGEN-NUTRIENT RELATIONSHIPS
WITHIN THE CENTRAL BASIN OF LAKE **OXYGEN-NUTRIENT**

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters; and Environmental Protection Agency, Fairview Park, Ohio.

N. M. Burns, and C. Ross. N.M. Burns, and C. Ross. In: Project HYPO: Canada Centre for Inland Waters Paper No 6, and Environmental Protection Agency Technical Report TS-05-71-208-24, February 1972, p 85-119. 19 fig. 13 tab., 3 plates, 10

Descriptors: *Dissolved oxygen, *Nutrients, *Lake Erie, *Hypolimnion, Mathematical models, Iron, Manganese, Phosphorus, Anaerobic condi-tions, Chlorophyll, Epilimnion, Sediments, Decomposing organic matter, Bacteria, Chemical properties, Nitrogen, Heat transfer, Phosphates, Alkalinity, Oxygen demand, Heat budget, Algae,

Eutrophication.
Identifiers: *Lake Erie Central Basin, Nutrient regeneration, Deoxygenation, Algal sedimenta-

The chemical budget components in Lake Erie's Central Basin were calculated. A large erosion of the hypolimnion during July 1970 seemed the initial factor in starting the algal growth period lasting to October; the first heavy bloom resulted in algal fall-out onto the lake floor at the end of July. For a while these sedimented algae were photosynthetic, ameliorating oxygen depletion but not preventing net oxygen depletion caused by organic decay. Aerobic heterotrophic and sulfate-reducing bac teria increased steadily while the algae on the bot-tom died and matted down. Loss of oxygen from photosynthesis plus activity of the large bacterial populations caused high oxygen depletion rate with anoxic conditions appearing on August 12th. Another period of algal rains, about August 17th, again diminished the oxygen depletion rate but was insufficient to prevent spread of anoxia which, by August 25th, extended across the hypolimnion area. The anoxic condition caused large scale nutrient regeneration by dissolution of inorganic forms. A massive bloom resulted when these nutrients were mixed with surface water during September. Oxygenated conditions should be maintained in the water as a simple mechanism for ensuring that little of the phosphorus in the sediments returns to the overlying water. (See also W72-12990) (Jones-Wisconsin) W72-12997

UPTAKE AND METABOLISM OF 2,2-BIS- (P-CHLOROPHENYL)-1,1,1-TRICHLORO
ETHANE (DDT) BY MARINE PHYTOPLANKTON AND ITS EFFECT ON GROWTH AND
CHLOROPLAST ELECTRON TRANSPORT,
Scripps Institution of Oceanography, La Jolla, Calif

G. W. Bowes.

Plant Physiology, Vol 49, p 172-176, 1972. 3 fig, 1 tab, 31 ref.

Descriptors: *Oceans, *Matabolism, *Marine al-gae, *Chlorinated hydrocarbon pesticides, gae, *Chlori *Cytological Absorption, studies, Phytoplankton, Plant growth, Chlorophyll, DDE, Inhibition.

Identifiers: *Electron transport, Dunaliella tertiolecta, Cyclotella nana, Thalassiosira fluviatilis, Amphidinium carteri, Coccolithus huxleyi, Porphyridium, Skeletonema costatum.

Marine phytoplankters were studied relative to their interaction with DDT. At 80 ppb DDT,

growth of Dunaliella tertiolecta was unaffected, and there was slight, if any, influence on develop-ment of Cyclotella nana, Thalassiosira fluviatilis, Amphidinium carteri, Coccolithus huxleyi, and Porphyridium. Skeletonema costatum exhibited a 9-day lag before cell division, growth subsequently being the same as the control. Ability of marine phytoplankton to metabolize DDT varied. DDE was the only significant hexane-soluble metabolite detected. It occurred in cells of S. costatum, C. nana, T. fluviatilis and D. tertiolecta. Maximum degree of conversion was 7.5% and was based on DDT found in cell-water system of 9-day D. tertiolecta cultures. The total recovered from cultures in 2- to 3-week experiments ranged from 63.5% for T. fluviatilis to 90.7% for S. costatum. Amount of DDT found associated with the cells, collected by centrifugation, in the cell-water system ranged from 70.8 to 99.5%. Noncyclic electron flow, measured by ferricyanide reduction was inhibited by DDT and DDE, and could explain growth inhibition. Phytoplankton sensitivity to toxic hydrophobic chlorinated hydrocarbons may be dependent upon penetration of the molecules to active sites within membranes. (Jones-Wisconsin) W72-12998

AGRICULTURAL WASTES AND ENVIRON-

MENTAL POLLUTION, Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.

In: Advances in Environmental Science and Technology, Vol 2, p 215-261. Wiley Inter-Science, New York, 1971. 5 fig, 11 tab, 91 ref.

Descriptors: *Agriculture, *Wastes, *Pollutants, *Air pollution, *Water pollution, Salts, Farm *Air pollution, *Water pollution, Salts, Farm wastes, Fertilizers, Pesticides, Watersheds (Basins), Management, Runoff, Soil erosion, Wind erosion, Herbicides, Irrigation, Feed lots, Livestock, Eutrophication, Water quality, Water pollution control, *Treatment facilities. Identifiers: Processing wastes.

The current status of environmental pollution from agricultural wastes (any by-product or residue from agricultural operations that may affect the quality of the environment either directly or indirectly) is discussed. Air pollutants, products of soil erosion, salinity, animal wastes, agricultural chemicals, fertilizers, and pesticides are considered. Existing management practices should be improved and advances in production developed for efficiency compatible with safeguarding the environmental quality. Curbing runoff and soil loss can solve many problems. Existing erosion control practices, universally adopted, would be effective if constantly modified to meet intensification of agricultural operations. Increasing fertilizer use efficiency would minimize pollution hazards from plant nutrients. The design of facilities for intensive animal production can be improved and technology developed for safer and economical disposal of animal wastes. Alternatives for the use of persistent insecticides are currently being investigated. The increasing use of herbicides calls for safety evaluation of the new compounds developed. Pollution hazards would decrease with new and improved methods for applications. These controls may not be achieved without some cost to the farmer, and those costs may have to be absorbed as part of overall production. (Jones-Wisconsin) W72-12999

ESTIMATION OF THE BIOMASS OF PLANK-

Municipal Waterworks of Amsterdam (Netherlands) G. P. H. van Heusden.

Hydrobiologia, Vol 39, No 2, p 165-208, 1972. 21 fig, 15 tab, 20 ref.

Descriptors: *Biomass, *Plankton, *Estimating, *Mathematical studies, Volume, Distribution, Estimating equations, Rating curves, Frequency

Identifiers: Poisson distribution, Gauss distribu-

The many mathematical relations found in the planktonic biocoenosis and in its seasonal and spatial distribution are presented together with a new technique of sampling and counting. A mathematical function is demonstrated in the numbers of individuals of the various species. A similar probability relation is found in the volumes of the individuals of the species as well as in the population biomasses. An approximate hyperbolic function can be derived from the population volumes and with the aid of a simple equation the plankton biomass calculated. A modus operandi is given. The biomasses of the populations in various samples may easily be compared using the hyperbolic or the probability relationship and the plankton biomasses in various habitats can easily be compared in a graphic way. The logarithms of the biomasses follow a probability curve and may be plotted and compared on a cumulative logarithmic probability graph. Sampling at ten places and working with the mean is compulsory. A reliable mean may be calculated using the hyperbolic function which seems to describe their densities. International standardization of the method of estimation of the plankton biomass and the expression of the results is proposed. (Jones-Wisconsin) W72-13000

ASPECTS OF POLLUTION IN SOME SOUTHAMPTON WATER,

Southampton Univ. (England). Dept. of Oceanog-J. E. G. Raymont.

Proceedings Royal Society of London, B, Vol 180, p 451-468, 1972. 8 fig, 3 tab, 25 ref.

Descriptors: *Ions, *Water pollution effects, *Estuaries, *Nutrients, Iron, Zinc, Copper, Nickel, Clams, Mercury, Water temperature, Sediment load, Benthos, Powerplants, Organic matter, Phytoplankton, Zooplankton, Salinity. Organic Identifiers: *Southampton Water (England), Trace metals, Bivalves, Thermal effects, Particulate

Concentrations of primary nutrients and certain metallic ions, in addition to oxygen data, were studied to ascertain the condition of Southampton Water. Concentrations inside the estuary differ from those toward the sea. Iron seems correlated with particulate matter; zinc is doubled; copper and nickel are only somewhat higher; mercury, zinc, and copper are concentrated by Mercenaria and other bivalves. Mud, especially rich in total mercury, may represent an important mercury source for these animals. Primary nutrients-phosphate, nitrate, and ammonium-increase as one proceeds up to the estuary. Surface waters are rich in nitrate and ammonium. Gross pollution seems unlikely in view of low nitrite concentrations and high oxygen values virtually throughout the estuary. Although thermal changes in Southampton Water appear slight, some increase Although thermal changes in in winter minimal temperatures and in summer maxima have occurred with no evident deleterious effects on organisms. Phytoplankton apparently endure at least 10C rise for short periods without injury. Zooplankton density has not decreased. Increase in Mercenaria population may be associated with the small thermal rise; remarkably high densities are encountered. Spawning appears correlated with summer temperatures exceeding 18-19C. (Jones-Wisconsin)

OBSERVATIONS ON THE NUTRIENT COMPOSITION OF A FRESHWATER LAKE

OBSERVATIONS ON THE NOTKIENT COMPOSITION OF A FRESHWATER LAKE ECOSYSTEM,
North Dakota Univ., Grand Forks. Dept. of Biology; State Univ. Coll., Plattsburgh, N.Y. Dept. of Biological Sciences; and Arizona State Coll., Flagstaff, Dept. of Biology.
M.K. Wali, G. K. Gruendling, and D. W. Blinn.
Archiv fur Microbiologie, Vol 69, No 4, p 452-464, 1972. 1 fig, 5 tab, 29 ref.

Descriptors: *Nutrients, *Water circulation, *Lakes, *Sediments, Productivity, Chemical properties, Rainfall, Cycling nutrients, Ions, Oligotrophy, Absorption, Runoff, Sedimentation rates, Phytoplankton, Mud-water interfaces, Aquatic plants, Organic matter. Identifiers: *Marion Lake (British Columbia).

Phytoplankton productivity is low in Marion Lake, Priish Columbia, because of low nutrient content attributable not only to the flushing of the lake, higher rainfall, and the insoluble nature of the granite forming the lake bottom, but also because of the binding of the nutrient ions by organic matter in the sediments. This ion binding and the subsequent weak dissociation of cations from the stable metal-organic matter complexes renders nutrients unavailable for phytoplankton growth in surface waters. Epipelic algal productivity is high because of much higher nutrient concentration at mud-water interface, showing probable involvement of an ion exchange system at the interface. High macrophyte productivity may be directly at-ributed to higher nutrient content of the sedi-ments. Higher nutrient levels in plant samples and low nutrient level in sediments with a plant cover as compared to open sediments point to ion uptake from the substrate. Higher nutrient content of the sediments of Marion Lake results from the surface runoff and seepage from surrounding, not yet stabilized, forest vegetation. This also explains why the trace metal concentrations are higher in sediments, since coniferous forest soils have a greater content of these ions. Al and Fe ions may also be important in organically binding phosphates. (Jones-Wisconsin)

THE INFLUENCE OF INCREASED NITROGEN FERTILIZATION ON THE NITRATE CONTENT OF GROUND WATER, For primary bibliographic entry see Field 05B.

THE VALUE OF THE SEED GERMINATION TEST FOR EVALUATING THE TOXIC ACTION

Leipzig Univ. (East Germany). Hygiene-Institut. For primary bibliographic entry see Field 05A. W72-13010

DISTRIBUTION OF REDUCED INORGANIC COMPOUNDS AND THEIR OXIDATION IN

LAKES, Ehime Univ., Matsuyama (Japan). M. Nikaido.

Mem Ehime Univ Nat Sci Ser B Biol. Vol 6, No 3:

p 159-172. 1970. Illus. Map. Identifiers: *Inorganic compounds, Distribution, Japan, *Lakes, *Oxidation.

Distribution, formation and oxidation of reduced inorganic compounds in Lake Suwa and Lake Kojima were studied during the summer of 1969. The reduced inorganic compounds in Lake Suwa consisted mainly of ferrous Fe in the water and large amounts of other ferrous compounds except ferrous sulfide in the mud. Those in Lake Kojima consisted of H2S in the water and ferrous sulfide in the mud. Difference between the reduced inorganic compounds of both the lakes is governed by the presence or absence of sulfate, and these compounds in the lake waters may be mainly supplied

from the mud. Appearance of the mixed water layers, where dissolved 02 coexists with sulfide S or ferrous Fe indicates that the 02 consumption in the hypoliumion is caused not only by a microbial reduction process but also by chemical oxidation of the reduced inorganic compounds.—Copyright 1972, Biological Abstracts, Inc. W72-13012

RESIDUE LEVELS OF DIELDRIN IN AQUATIC INVERTEBRATES AND EFFECT OF PRO-LONGED EXPOSURE ON POPULATIONS, Georgia Univ., Athens. Coll. of Agricultural Ex-

periment Stations.

J. B. Wallace, and U. Brady.
Pestic Monit J. Vol 5, No 3, p 295-300. 1971. Map. Identifiers: "Water pollution effects, Industrial wastes, Aquatic animals, Cheumatopsyche sp, "Dieldrin, Exposure, Hydropsyche sp, Invertebrates, Physa spp, Populations, Residue, Simulium vittatum, South Carolina.

A woolen mill that uses dieldrin as a moth-proofing agent releases 0.2 ppm in the plant's effluent, which in turn empties into a small Piedmont river in South Carolina. The number of species of aquatic invertebrates downstream in this river has been greatly reduced, and population complexes have been altered. In all cases, dieldrin levels in extracts of specimens were higher downstream from the plant's effluent outfall than upstream. In some cases dieldrin residues in the downstream fauna were higher by a thousandfold than levels in the upstream counterparts. Downstream, the diel-drin residue, based on wet weights, was as high as 24 ppm in Simulium vittatum Zett. larvae (Diptera:Simuliidae); 23 ppm in Hydropsyche sp. and 103 ppm in Cheumatopsyche sp. larvae (Trichoptera:Hydropsychidae); and 62 ppm in snails (Physa sp.).—Copyright 1972, Biological Abstracts, Inc. W72-13014

EUTROPHICATION OF LAKE WATER MICROCOSMS: PHOSPHATE VERSUS NON-PHOSPHATE DETERGENTS, Monsanto Co., St. Louis, Mo.

Science. Vol 174, No 4011, p 827-829. 1971. Illus Identifiers: *Water pollution effects, Algae, *Detergents, Diversity, *Eutrophication, Lakes, Microcosms, Nonphosphates, Phosphates.

The eutrophication potentials of a phosphate-containing detergent and 2 phosphate-free detergents, as determined in oligotrophic algal microcosms after activated sludge treatment, were not signifi-cantly different. All activated sludge effluents, including those from detergent-free waste water, lowered the algal diversity of the microcosms to about the same extent below that of the lake water controls.—Copyright 1972, Biological Abstracts, W72-13015

PRELIMINARY INVESTIGATIONS ON THE POSSIBILITY OF APPLICATION OF MINING AND INDUSTRIAL WASTE MATERIALS TO FERTILIZATION OF SANDY SOILS: I. IN-FLUENCE OF WASTE MATERIALS ON THE INITIAL GROWTH OF PLANTS UNDER LABORATORY CON DITIONS, (IN POLISH), Wyzsza Szkola Rolnicza, Lublin (Poland).

wyzza zskości koliteża; Lubili (roland): S. Nawrocki, and T. Kesik. Ann Univ Mariae Curie Skłodowska Sect E A gric. 24: p 125-133. 1969. English summary. Identifiers: Fertilization, Growth, *Industrial wastes, Laboratory, Materials, *Mine wastes, Plants, *Sendy soils.

The chemical activity of loams, after flotation waste materials from a Cu-mine, and waste materials of colloidal silica neutralized with phosphorites or with B, Mn or Cu was examined. The influence of the examined waste materials on the germination and initial growth of plants varied. A negative effect of the addition of Mn, B and Cu waste materials to those of silica was observed in pure nutrient media. This effect disappeared with the dilution of waste materials in sandy soil. The waste materials of silica with those of Mn and B ones inmaterials of silica with those of Mn and B ones in-hibited root growth. The best germination and ini-tial growth of plants was obtained with Turoszow loams, silica waste materials with phosphorites and after-flotation materials.—Copyright 1972, Biological Abstracts, Inc. W72-13029

RURAL WATER-SUPPLY DEVELOPMENT AND THE RECENT APPEARANCE OF EN-DEMIC GOITRE,

East African Inst. for Medical Research, Mwanza (Tanzania).

. Van Amelsvoort Trop Geogr Med. Vol 23, No 3, p 304-305. 1971. Identifiers: *Endemic, Goiter, *Human diseases, *Nigeria, *Iodine content, Public health.

Estimations of the I content in underground and surface water in a Nigerian village support the surface water in a Nigerian village support the hypothesis that a change from the use of river water to the use of well water caused the recent appearance of endemic goiter.—Copyright 1972, Biological Abstracts, Inc.
W72-13032

STUDY OF THE DEGREE OF INFEC-TIOUSNESS OF THE RED-SPOT DISEASE OF CARPS IN FISH FARMS CURED BY A COM-BINED METHOD, (IN RUSSIAN),

S. K. Bol'Shakov, and N. A. Shantarina.

Sb. Nauchno-Tekh Inf Krasnodar Fil Vses
Nauchno-Issled Inst Prud Rybn Khoz. 1. p 24-28.

Identifiers: *Carps, *Diseases, Fish, Infectiousness, *Red-Spot disease.

Studies were made on the contagiousness of the red-spot disease on 1 yr old carps raised in the Angelinskiy fish hatcheries and on yearlings imported from healthy fish hatcheries. Three spawning ponds of 0.1 ha and 1 control pond having a surface of 18 ha and with an independent water supply were used. Stocking the pond with fish by a local planting material was done in April, and imported material in May 1967. In imported, clinically healthy carp, signs of red-spot disease were not noted. In early recovered fish hatcheries, a decrease in virulence was noted.—Copyright 1972, Biological Abstracts, Inc. W72-13033

CURRENT CONDITION AND PROBLEMS OF THE FURTHER STUDY OF INFLAMMATION OF THE SWIM BLADDER, (IN RUSSIAN),

Sb Nauchno-Tekh Inf Krasnodar Fil Vses Nauchno-Issled Inst Prud Rybn Khoz. 1. p 19-23.

Identifiers: *Bladder, *Carps, Fish diseases, Inflammation

Etiology of the inflammation of the swim bladder (ISB) is not clarified. The pathogenesis was also studied. Hematological, biochemical, histological and histochemical studies were conducted in the and instonemental studies were conducted in the course of the disease on carps of all age groups. In carps suffering from this disease, the sedimentation rate is accelerated 1.5-2.5 times, Hb level decreases by 21-42%, number of erythrocytes decreases by 18-42% and the number of leukocytes abruptly increases. Changes of the metabolism and morphostructure in the swim bladder, liver, kidneys and spleen occur. Disinfectants and medicinal preparations used in hot ponds were tested for the control of ISB.—Copyright 1972, Biological Abstracts, Inc.

Group 5D - Waste Treatment Processes

5D. Waste Treatment Processes

A PLAN FOR WATER AND SEWER. Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga. For primary bibliographic entry see Field 06D.

PWR WATER: VARYING CHEMISTRY AND 'HOT' CONTAMINANTS, Westinghouse Electric Corp., Pittsburgh, Pa.

W. D. Fletcher.

Industrial Water Engineering, p 18-22, March 1971. 4 fig, 2 tab.

Descriptors: *Water chemistry, Hydrogen ion concentration, *Demineralization, Radioactivity, *Corrosion control, Cobalt radioisotopes, Tritium, *Waste water treatment.

Identifiers: *Pressurized water reactors, Impurities, Neutron poison, Decay, Reactor coolant, Ac-

All raw water for the Reactor Coolant System is purified either by multibed demineralizers or by flash evaporators. Oxygen is eliminated by deaerating the makeup water admitted to the system, and by maintaining excess dissolved hydrogen in the reactor coolant. Reactor coolant pH is controlled by 1 ppm of lithium hydroxide. Boric acid is added as a soluble neutron poison to the coolant for reactivity control to supplement the control rods. As core burn up progresses, the coolant's boron concentration is reduced, at a rate of approximately 100 ppm per month, from an initial value of about 1500 ppm to a level of less than 10 ppm. Advantage is taken of holdup in the system to provide for decay of short-lived fission products so as to reduce the burden on waste products so as to reduce the bureen on waste disposal systems and the release to the environment. Tritium, which is produced in significant quantities in the fuel is important because of its long half iffe and because it does not lend itself, when associated with water, to concentration or separation processes as, for example, iodine does. (Upadhyaya-Vanderbilt) W72-12465

TRANSACTIONS OF THE THERMAL EF-FLUENT INFORMATION MEETING.

Transactions of Meeting, July 9, 1970, Boise, Idaho, Idaho Nuclear Energy Commission, Idaho Falls, Idaho, (1970). 82 p, 2 fig, 10 photos, 1 tab, 2

Descriptors: *Conferences, *Heated water, *Beneficial use, *Thermal pollution, Electric powerplants, *Idaho, Water sources, Air conditioning, Deicers, Aquiculture, Fish management, Nuclear powerplants, Irrigation, Frost protection, Water reuse.

A summary of how the State of Idaho stands in making meaningful use of warm water from industrial plants is presented. Topics discussed in talks at a conference held in July 1970 include characterization, sources, and disposition of thermal effluents; urban uses of heat such as residential heating and cooling, increasing reaction rates in sewage treatment, de-icing and de-fogging airports, and heating greenhouses; heated water in aquiculture; present uses of thermal groundwater in Idaho; problems of thermal pollution in fish life cycles; constraints in the use of nuclear power plant waste heat; industrial process uses and evaporative effects; and horiticultural frost protection, cooling, and irrigation. A great number of possible uses of warm water are presented. It is concluded that thermal water should be used to benefit the immediate area of plant location. Suggestions presented by four study groups are in-cluded in an appendix. (See W72-12467 thru W72-12474) (Eagle-Vanderbilt) W72-12466

THERMAL EFFLUENT-WHAT IT IS, WHERE IT COMES FROM AND WHERE IT GOES, Idaho State Univ., Pocatello. Dept. of Nuclear Science and Engineering. For primary bibliographic entry see Field 05b.

UTILIZING WASTE HEAT FOR URBAN

SYSTEMS, Westinghouse Electric Corp., Pittsburgh, Pa.

J. A. Nutant.
In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970, Idaho Nuclear Energy Commission, Idaho Falls, Idaho, (1970), p 18-23.

Descriptors: *Beneficial use, *Heated water, *Cities, Electric powerplants, Air conditioning, Heating, Deicers, Aeration, Sewage treatment, Greenhouses, *Water reuse, *Thermal pollution.

Some concepts investigated in a program to determine economic and/or social benefits from combinations of urban systems and power plant resources are reviewed. Hot water has proven to be a practical method for residential space heating in Lesland The problem of finding a use for their or a practical method for residential space healing in Iceland. The problem of finding a use for ther-mal effluents in the summer could be solved providing residential air conditioning by an ammonia or lithium bromide absorption refrigeration mechanism using an input energy of hot water. A 1000 Mwe nuclear plant could serve a population of about 450,000 with electricity, heating and cooling. A system which would use waste heat only during the summer months is injection of oxygen into condenser water and release into the recip stream, aerating it. Effluent from a power plant can also be transferred to sewage plants, increasing the temperature of the sewage and thus its rate of reaction. Other uses for waste heat described briefly are de-icing and de-fogging airports and heating greenhouses. (See also W72-12466) (Eagle-Vanderbilt) W72-12468

HEATED WATER IN AQUICULTURE, Oregon State Univ., Newport. Dept. of Fisheries and Wildlife For primary bibliographic entry see Field 05C.

UTILIZATION OF HOT GROUNDWATER IN ELMORE AND OWYHEE COUNTIES, IDAHO, Idaho Dept. of Water Administration, Boise. D. R. Ralston.

In: Transactions of the Thermal Effluent Informa tion Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho, p 29-34, 1 ref, 1970.

Descriptors: *Beneficial use, *Thermal water, *Irrigation, Temperature, Heated water, "Idaho, Heating, Greenhouses, Recreation facilities, Swimming pools, Hay, Grains (Crops), *Water reuse, "Thermal pollution.

Hot groundwater may be found in many parts of Idaho. The history and present use of the resource provides useful insight into the utilization of thermal effluents. Water from 90 to 185 degrees is piped into greenhouses for heat dissipation and then used for irrigation in Owyhee County. Water ranging from 85 to 100 degrees is piped through hot water lines and heaters in homes for residential heating. Several public swimming facilities in Owyhee County are supplied by water at temperatures less than 140 degrees. Irrigation is the most dominant use for hot groundwater in Elmore and Owyhee Counties. Hot water is applied directly or after cooling in a pond or by a spray and recollec-tion system to hay and grain crops. Yields are ap-proximately equal to those of neighbors using river water for irrigation. Because of the lengthened growing season, the farmers can get an extra cutting of hay. More labor is involved, however, in the use of hot groundwater. (See also W72-12466) (Eagle-Vanderbilt) W72-12470

THERMAL POLLUTION AND THE AQUATIC ENVIRONMENT, Idaho Dept. of Fish and Game, Boise For primary bibliographic entry see Field 05C.

CONSTRAINTS AND GUIDELINES IN HAR-NESSING NUCLEAR POWER PLANT WASTE

HEAT, Idaho Nuclear Corp., Idaho Fails. F. R. Keller, and N. K. Sowards.

W72-12471

In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho, p 39-46, 2 fig, 1970. AEC AT (10-1)-1230.

Descriptors: *Beneficial use, *Heated water, *Nuclear powerplants, Greenhouses, Irrigation, Temperature, Fish farming, Recreation, *Idaho, Multiple purpose, *Thermal pollution, *Water reuse.
Identifiers: *Cooling ponds.

Sites of nuclear powerplants and local monthly average minimum and maximum temperatures were considered, indicating the difficulty in removing the heat without producing thermal ef-fluent. Drawbacks and possibilities of using heated water for greenhouse heating, irrigation, and fish culture are mentioned. If a larger market for fish were developed, fish culture could reduce problems from both sewage and thermal effluents. Cooling ponds offer possibilities in many locations to use some of the heat value. Cooperative projects are encouraged with one proposed for Southeastern Idaho using heated water for irrigation with excess water going to a cooling pond which could be used as a fish farm or for recrea-tional purposes. (See also W72-12466) (Eagle-Van-W72-12472

THERE'S GOLD IN THEM THAR BTUS, Washington State Office of Nuclear Energy Development, Olympia. L. B. Bradley.

In: Transactions of the Thermal Effluent Information Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho, p 47-57, 1 ref. 1970.

Descriptors: *Beneficial use, *Heated water, *Electric powerplants, Industrial water, *Thermal pollution, Evaporation, Irrigation, Condensers.

The increasing use of electric power and its con-current production of heat that must be dissipated were cited indicating a supply of heat energy to be used productively. Industrial process uses and evaporative effects where needed were discussed in detail. Industry should disperse itself before water, air, land and people pollution force it to move. Industries are listed which use fresh water and an example is given of a plant producing magnesium oxide from sea water and its turbid effluent diluted in power plant effluent. Vapor barriers can be formed to give frost and freeze control in agricultural areas near power plants. Vapor from cooling towers could be condensed to provide irrigation or reservoir makeup supply. Technologists are urged to develop new design concepts for condensers and to concentrate research on the full process flow spectrum. (See also W72-12466) (Eagle-Vanderbilt) W72-12473 THE THERMAL-WATER HORTICULTURAL DEMONSTRATION PROJECT AT SPRING-FIELD, OREGON,

Vitro Corp. of America, Portland, Oreg. H. Miller.

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H. Miller. In: Transactions of the Thermal Effluent Informa-tion Meeting - Boise, Idaho, July 9, 1970. Idaho Nuclear Energy Commission, Idaho Falls, Idaho, p 58-68, 5 photos, 1970.

Descriptors: "Agriculture, "Irrigation, "Heated water, "Thermal pollution, Temperature, Orchards, Meteorological data, On-site investiga-tions, Idaho, "Oregon, Frost protection, Crops, Cooling, "Water reuse, "Sprinkler irrigation.

A field-demonstration agricultural project was set A fleta-demonstration agreement the property of the property o used on orchards. Warm water from sprinklers can cool plants suring warm, dry summer weather. Warm-water irrigation, normal-water irrigation, and no irrigation are being compared with respect to rate and amount of water application, at-mospheric temperatures, humidity, soil moisture and temperature, and crop yield. Crops being ir-rigated are orchard crops, walnuts, pole beans, sweet corn, tomatoes, bush beans, potatoes and a variety of graden crops and nursery plants. The sweet corn, tomatoes, outsi beaus, postatoes and variety of graden crops and nursery plants. The pump and line arrangement are described as are the valve controls for individual farmers and the sprinkler system. Two weather stations record meteorological conditions on and outside of the project area. (See also W72-12466) (Eagle-Vanderbilt) W72-12474

HOW TO PLAN A PROGRAM FOR LIQUID EF-FLUENT CONTROL, Calgon Corp., Pittsburgh, Pa. Water Management

For primary bibliographic entry see Field 05G. W72-12475

PROVINCE OF ONTARIO'S PROGRAM FOR FINANCING, CONSTRUCTING AND OPERATING WATER POLLUTION CONTROL AND WATER SUPPLY FACILITIES, COrnell Univ., Ithaca, N.Y.

M. McTavish. In: Proceedings of the Symposium on Social and Economic Aspects of Water Resources Develop-ment, June 21-23, 1971, Ithaca, New York. American Water Resources Association, Urbana, Il-linois, 1972. p 244-245.

Descriptors: *Water supply, *Waste water treatment, *Treatment facilities, *Financing, Construction, Management, Local governments, Canada, Water treatment.

Identifiers: Provincial governments.

Ontario's municipalities have three means of financing water and sewage treatment facilities. They can finance the project through (1) municipal debentures, (2) the Ontario Water Resources Comdebentures, (2) the Ontario Water Resources Commission (OWRC) as an OWRC/Municipal project, or (3) the Commission as an OWRC/Provincial works. Under the municipal type of financing, the Commission provides works for the municipality on a pay back arrangement. This approach allows financing over a longer period of time than municipal debentures would provide, and the municipality enjoys the supervision of the Commission at no charge. Under the provincial plan, the municipality is billed on a use basis. A rate for municipality is billed on a use basis. A rate for water or sewage service is agreed upon and the yearly bill to the municipality is based upon the flow and the rate. In either approach the municipality is not billed for the supervisory services of the head office of the Commission. The operator's salaries, direct operating costs, and capital cost are billed, subject to certain conditions, to the project. The program's advantages to the municipality include increased technical expertise, a financial advantage, and improved management efficiency. Disadvantages include possible con-flicts between Commission objectives, loss of local control, and potential unresponsiveness to municipal needs. (See also W72-10480) (Settle-Wisconsin) W72-12480

INTERNATIONAL SYMPOSIUM ON WATER POLLUTION CONTROL IN COLD CLIMATES. Alaska Univ., College. Inst. of Water Resources. For primary bibliographic entry see Field 05C. W72-12548

THE INFLUENCE OF TEMPERATURE ON THE REACTIONS OF THE ACTIVATED SLUDGE

PROCESS,
Research Institute for Water Resources Development, Budapest (Hungary). Water Quality and Technology Dept.
P. Benedek, and P. Farkas.

In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 164-179. 7 fig, 2 tab, 16 ref, append.

Descriptors: *Waste water treatment, *Temperature, *Sewage treatment, *Activated sludge, Cold regions, Biological treatment, Mathematical models, Physicochemical properties, Kinetics, Oxidation, Metabolism, Municipal wastes, Phenols, Colloids, Industrial wastes. Identifiers: *Arrhenius law, Casein, Starch,

Acetate, Sucrose.

The physico-chemical basis of temperature dependence in activated sludge is discussed. Endogenous metabolism, not metabolism of disdogenous metabolism, not metabolism of dis-solved substrate follows the Arrhenius law. The adsorptive mechanism of activated sludge also has a temperature dependence, but this amounts to less than 10% of the thermal dependence of biolog-ical processes. Value of grams-oxygen consumed per gram substrate oxidized was found practically constant in the range of 0-25C. Temperature de-pendence of continuously working activated pendence of continuously working activated sludge plants is usually less than would be expected from non-steady state measurements. Furthermore, most wastes contain colloids, the removal rate of which does not depend on temperature. A great difference may be encountered in the thermal dependence of treatment efficiency, depending on whether the waste contains colloids or dissolved compounds, in favor of the former. Great importance has to be attributed to heat storage in water bodies underlying biological treat-ment; a system with long detention time may not be economic, because the thermal reserve—con-sequently higher removal rate—of a ahort detention time system may compensate for the long deten-tion time with heat loss in a total oxidation plant. (See also W72-12548) (Jones-Wisconsin) W72-12558

EVALUATION OF AERATED LAGOONS AS A SEWAGE TREATMENT FACILITY IN THE CANADIAN PRAIRIE PROVINCES,

Metropolitan Corp. of Greater Winn (Manitoba). Water Works and Waste Disposal R. Pick, G. E. Burns, D. W. Van Es, and R. M. sal Div.

In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 191-212. 13 fig, 3

Descriptors: *Aerated lagoons, *Sewage treatment, *Sewage lagoons, Domestic wastes, Pilot plants, Cold regions, Nutrients, Temperature, Studge, Mosquitoes, Suspended solids, Dissolved oxygen, Odor, Scum, Ice, Anaerobic conditions, Foaming, Capital costs, Construction costs, Operating costs, *Waste water treatment. Identifiers: *Winnipeg (Manitoba), Nutrient removal, Surface aerators.

A two-year study of aerated lagoons was undertaken because there was little documented information on their operation under Canadian prairie conditions. In order to assess the applicability of this process for treatment of domestic wastes, three pilot aerobic-anaerobic aerated lagoons were constructed during the summer and fall of 1967 in the corner of an existing stabilization nond for domestic sewage treatment from a tion pond for domestic sewage treatment from a separate system. Aerated lagoons were found to separate system. Aerated lagoons were found to be capable of providing 'secondary equivalent' sewage treatment. Under prairie climatic conditions there is a problem of sludge accumulation leading to declining efficiency of BOD removal and a reduction in the dissolved oxygen concentration during the summer months. The economic feasibility of aerated lagoons is questionable until the extent and cost implications of the sludge problem are fully defined by further research and experience. Use of surface aerators under marities winter conditions is not practical due to ice build-up. Conclusions are that aerated lagoons are an ef-fective means of providing secondary treatment but some provision must be made for sludge handling. (See also W72-12548) (Jones-Wisconsin) W72-12560 experience. Use of surface aerators under prairie

DESIGN CONSIDERATIONS FOR EXTENDED

AERATION IN ALASKA, Federal Water Quality Administration, College, Alaska. Cold Climate Research Program. S. E. Clark, H. J. Coutts, and C. Christianson. In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 213-236. 11 fig. 7 tab, 35 ref.

Descriptors: *Waste water treatment, *Alaska, Descriptors: "waste water treatment, "Alaska, Aeration, "Design, Dissolved oxygen, Ice cover, Sewage treatment, Aeration, Cold regions, Ac-tivated sludge, Temperature, Kinetics, Biological treatment, Laboratory studies, Suspended solids, Nutrients, Pilot plants. Identifiers: "Solids separation.

Extended aeration systems have considerable potential for reliable and economical secondary treatment at large community installations in Alaska. Laboratory and pilot plant studies on ac-tivated sludge were mainly limited to extended aeration, and included investigations of low temperature biokinetics, low temperature solids removal, degree of environmental protection required for equipment and processes, aeration requirements, aeration chamber mixing, and waste sludge characteristics and disposal. Feasibility of extended aeration activated sludge process as a relatively economical and effective means of secondary waste treatment was demonstrated. The process requires more consistent operation and process requires more consistent operation and maintenance than aerated lagoons—a disadvantage where costs are high and skilled operators are scarce. Cold climate studge wasting and disposal for the extended aeration process must be given consideration for the following reasons: excess solids production increases with decreasing temperature; shorter detention times to prevent freezing will also increase solids production at a given MLSS level; auto-induced sludge wasting may be expected to be more severe, placing greater potential stress on the receiving water; assimilative capabilities of the receiving water at cold temperatures are retarded. (See also W72-12548) (Jones-

CHEMICAL TREATMENT OF MECHANI-CALLY AND BIOLOGICALLY TREATED WASTE WATER, Norwegian Inst. for Water Research, Oslo. A. Rosendahl.

Group 5D-Waste Treatment Processes

In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 237-251. 4 fig, 4

Descriptors: *Sewage treatment, *Biological treatment, *Pilot plants, *Treatment facilities, *Waste water treatment, Chemical precipitation, Activated sludge, Sludge, Aeration, Tertiary treatment, ment, Sewage effluents, Coagulation, Floccula-tion, Sedimentation, Cold regions, Temperature, Flotation, Costs. Identifiers: Mechanical treatment.

Since Norway has only a few biological treatment plants, a more direct way of phosphorus removal by omitting the biological unit was sought. Although during 1967 some treatment plants were built in Sweden using mechanical/chemical treatment, systematic observational data describing the process were limited. Pilot plant studies were needed giving comparable results between mechanical/chemical and biological/chemical treatment systems, and results and experience that could be translated to full-scale treatment plants. In 1968 a study was started and results from 1-1/2 years' program are reported. Primary treated waste water was used in two plants and secondary treated waste water was used in two other plants. Parameters analyzed for evaluation of quality of the influent, effluent, and kinetics were: organic matter, chemical oxygen demand, biochemical oxygen demand, seven days test; total phosphorus, orthophosphate, nitrogen, Kjeldahl and the sum of nitrite-nitrate nitrogen; turbidity, pH, and alu-minum. Experimental results on removal of phosphorus and organic matter indicate that mechanical/chemical treatment should be considered first where eutrophication is the greatest problem in the receiving waters and phosphorus is the most important nutrient to be removed. (See also W72-12548) (Jones-Wisconsin) also W72-12 W72-12562

BIOLOGICAL AND CHEMICAL WASTE TREATMENT EXPERIMENTS IN FAR NORTHERN SWEDEN, P. Balmer.

In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 252-262. 6 fig, 6

Descriptors: *Biological treatment, *Waste water treatment, *Activated sludge, Temperature, Bacteria, *Aeration, Flocculation, Costs, Cold regions, Chemical precipitation, Phosphorus, Suspended solids, Sludge, Pilot plants, Sewage, Recirculated water, Settling basins, Hydrogen ion concentration, Effluents.
Identifiers: *Kiruna (Sweden), *Chemical treat-

Laboratory data show that the metabolizing activity of activated sludge is serious'y hampered at low temperatures, and BOD reduction data in activated sludge systems at low temperatures are partly contradictory. Pilot plant experiments were conducted with activated sludge and chemical treatment. The activated sludge treatment proved that biological treatment is possible even at very low sewage temperatures. As the metabolizing activity of the activated sludge bacteria is considerably reduced, long aeration periods, 4-5 hours, and large aeration basins, are required. Chemical treatment is much less sensitive to low temperatures and requires only about 0.5 hour detention time in flocculation tanks. Difference in investment costs will in many instances be so large that the increased running costs are justified. If a community has an existing primary treatment plant with a long detention time (more than 2 hours), it may be possible to achieve a substantial increase in treatment efficiency by simply adding flocculating chemicals to the influent. BOD removal with chemical treatment is somewhat inferior to what can be achieved with biological treatment. This drawback, however, is compensated by superior phosphorus removal. (See also W72-12548) (Jones-Wisconsin) W72-12563

BIOLOGICAL SEWAGE TREATMENT IN A COLD CLIMATE AREA,

Hokkaido Univ., Sapporo (Japan). Dept. of Sanita-

ry Engineering.
S. Terashima, K. Koyama, and Y. Magara.
In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 263-285. 19 fig, 6

Descriptors: *Biological treatment, *Waste water treatment, *Sewage treatment, *Cold regions, *Thawing, Temperature, Aeration, Activated sludge, Nitrogen, Nitrification, Biochemical oxygen demand, Drainage, Runoff, Suspended

Identifiers: *Sapporo (Japan), Oxygen transfer coefficient

Effects of thawing and the effects of low sewage temperature on activated sludge characteristics are considered. Rate of thawing run-off significantly relates to degree-hour. If these correlations are known for a certain drainage area, it is possible to predict the rate of thawing run-off from the highest and lowest atmospheric temperatures of the day. At low temperatures, oxygen transfer coefficient in the aeration tank decreases, but the mass of oxygen transfer increases slightly with lowering of temperature. Sludge volume index increases at low temperatures. It creates a high COD effluent. The value of sludge volume index changes with time after substrate contact with activated sludge. At a low sewage temperature, it is necessary to take sufficiently prolonged aeration time to stabilize the activated sludge which ab-sorbed substrate. The removal ratio of soluble COD is not affected by a sewage temperature decrease but total COD of effluent increases due to an increase of suspended matter. Soluble COD removal rate varies with temperature. Removal of organic and ammonium nitrogen and nitrification rate are formulated. These rates decrease with lower temperatures and temperature coefficients are larger than that of removal of COD, thus effluent of low sewage temperature contains high nitrogen. (See also W72-12548) (Jones-Wisconsin) W72-12564

MICROBIOLOGIC INDICATORS OF THE EF-FICIENCY OF AN AERATED, CONTINUOUS-DISCHARGE, SEWAGE LAGOON IN NORTHERN CLIMATES,

North Dakota Univ., Grand Forks. School of

J. W. Vennes, and O. O. Olson.

In: International Symposium on Water Pollution Control in Cold Climates, July 22-24, 1970, University of Alaska, College, p 286-311. 4 tab, 5 ref, append.

Descriptors: *Sewage bacteria, *Waste water treatment, *Sewage lagoons, *Cold regions, Aerated lagoons, *North Dakota, Biochemical oxygen demand, Bacteria, Temperature, Coliforms, Enteric bacteria, Nitrogen, Vitamins, Suspended solids, Lactobacillus, Chlorella, Sulfur bacteria, Algae, Salmonella, E. coli. Identifiers: *Continuous discharge lagoon.

The aerated lagoon, a development in biological waste treatment was studied in Harvey, North Dakota. Coliform, fecal coliform, and enterococci were determined as well as BOD, nitrogen, pH, total and suspended solids; and total bacterial populations enumerated. Lagoon efficiency depends on temperature and oxygen; their effect on biologic stabilization is determined and the findings are reflected in relative abundance of several microbial species and in BOD. Coliform, fecal coliform, and enterococcal numbers in the secondary lagoon during zero centigrade temperatures were directly related to BOD and total nitrogen. During summer temperatures, little cor-relation between these organisms and BOD and total nitrogen was noted. There was a correlation between the total microbial population and BOD at summer temperatures. Since only 1% or less of the total microbial population is represented by the enteric organisms studied, it is apparent that other organisms must be studied to define better the role of microbiologic indicators in the efficiency of this sewage treatment system. A system concerned with production and utilization of the vitamin B, biotin, is being studied, since it relates to several organisms that thrive in sewage oxidation lagoons. (See also W72-12548) (Jones-Wisconsin) W72-12565

DISINFECTION AND TEMPERATURE IN-

FLUENCES, Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research

C. Chambers, and G. Berg. C. Chambers, and G. Berg.
In: International Symposium on Water Pollution
Control in Cold Climates, July 22-24, 1970,
University of Alaska, College, p 312-328. 10 fig, 37

Descriptors: *Waste water treatment, *Disinfec-tion, *Temperature, *Cold regions, *Alaska, Ef-fluents, Coliforms, Enteric bacteria, Viruses, Groundwater, Chlorine, Hydrogen ion concentra-tion, Iodine, Water pollution sources, Lime, Bac-tericides, Ozone, Bromine, Gamma rays, Ul-traviolet radiation, Ice cover. Identifiers: *Pasteurization.

Some conventional and unconventional disinfection methods are examined relative to their potential strengths and weaknesses for disinfecting effluents under cold climatic conditions. They are discussed according to their effect on bacteria and viruses. Bactericidal and general considerations of chlorine, iodine, excess lime, ozone, bromine, pasteurization, gamma radiation, and ultraviolet light are considered. Since viruses can be stored at -70C for a decade or more, the normal die-off of viruses experienced in warmer climates does not occur in sewage and water in cold climates. The effects of chlorine, iodine, ozone, ultraviolet light, and gamma radiation on viruses are detailed. All disinfectant research should be planned to provide the best possible basis for determining overall costs for application in various locations. In Alaska, the cost of shipping lime would be prohibitive in some inland locations, and ozone would tive in some inland locations, and ozone would require electrical service. A spectrum of proven disinfection processes should be developed from which the one most applicable to a specific waste disinfection problem can be selected. Only through such an approach can the waste water disinfection needs of Alaska and similar cold climatic areas be satisfied. (See also W72-12548) (Jones-Wisconsin) Wisconsin)

DISTRICT OF COLUMBIA WATER POLLUTION CONTROL PLANT (EXPANSION AND UPGRADING), (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Philadelphia,

Pa. Region III.

Available from the National Technical Informa-tion Service as EIS-DC-72-4478-D, \$28.25 in paper copy, \$0.95 in microfiche. Report ELR-4478, May 8, 1972, 525 p.

Descriptors: *Sanitary engineering, *District of Columbia, Sewage, Wastes, Land use, Aesthetics, *Treatment facilities, Sewage treatment, Water quality, Control, Public health. Identifiers: *Environmental impact statements, *Water pollution control plants.

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The proposal is described which would expand from 240 mgd to 809 mgd and upgrade (from secondary to tertiary treatment) the existing District of Columbia Water Pollution Control Facilities. The adverse environmental effects are air quality; potential for spillage during fuel transfer and other unloading operations; and minor long-term effects include noise generation, aesthetic intrusion, and land use changes.

W72-12630

SEWAGE SLUDGE INCINERATION. Environmental Protection Agency, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-211 323, \$3.00 in paper copy, \$0.95 in microfiche. Environmental Protection Agency Report No. EPA-R2-72-040, August 1972, 89 p, 2 fig, 10 tab, 5 ref, 9 append. EPA Program Element B 12043.

Descriptors: *Incineration, *Ultimate disposal, *Sludge disposal, *Waste treatment, Air pollution effects, *Sludge, Pesticide removal, Heavy metals, Polychlorinated biphenyls. Identifiers: *Multiple hearth furnaces, *Fluidized bed incinerators, Stack emissions, Ocean disposal, Particulate removal.

A Task Force was established within the Environmental Protection Agency to evaluate sludge incineration as an acceptable alternative to sea disposal. Multiple-hearth and fluidized bed furnaces, containing scrubbing devices for particulate removal, were selected for performance evaluation. The sludge, particulate, stack gas, scrubbing liquid, and ash were sampled and analyzed for heavy metals, pesticides and oxides of nitrogen and sulfur. The results indicated that incinerators are capable of achieving low emission concentrations for the common pollutants. Particulate samples showed a measurable concentration of lead. The ash samples normally showed a higher concentration of the heavy metals when compared with the sludge samples, however, mercury was one of the exceptions and was not detectable in the with the sludge samples, however, mercury was one of the exceptions and was not detectable in the ash sample and assumed lost to the stack gases. The pesticides and PCB, present in the sludge, were not detectable in either the ash or the scrubbing water, and indicated complete destruction. The study demonstrated that well designed and operated municipal sewage sludge incinerators can meet the most stringent existing particulate emission control regulation. (EPA abstract) W72-12631

A SYSTEM FOR THE TREATMENT OF POULTRY PLANT WASTES, University Coll., London (England). D. G. Kilburn, and P. C. Trussell. Water and Waste Treatment, p 618-622, March/April 1966. 4 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Water pollution control, Effluents, Water quality control, Sewage lagoons, Acration, Biochemical oxygen demand, Flocculation, Poultry.
Identifiers: *Poultry evisceration wastes, Alum

The problem of wastewater disposal in the poultry eviscerating industry has become acute with the increased quality of effluent demand by pollution control authorities. The waste treatment system designed for Panco Poultry Ltd. is discussed as one solution to the problem. The system shows that a fairly inexpensive treatment plant consisting of unlined lagoons with a minimum of aeration equipment can provide effective results. (Svensson-Washington)
W72-12678

ALGAL GROWTH POTENTIAL TEST IM-PROVES SEWAGE EFFLUENT CONTROL, Uppsala Univ., (Sweden). Inst. of Physiological

Botany.
For primary bibliographic entry see Field 05C.
W72-12728

FLOC STRENGTH AND FILTERABILITY OF PRETREATED WATER. Ludwig Engineering and Science Research Foun-dation, Arcadia, Calif. For primary bibliographic entry see Field 05F, W72-12794

AUTOMATIC CONTROL OF AN ACTIVATED SLUDGE REACTOR. Connecticut Univ., Storrs.

Available from the National Technical Informa-tion Service as PB-211 334, \$3.00 in paper copy, \$0.95 in microfiche. Final report, February 11, 1971, 23 p, 16 fig. FWQA Grant No. 17050 EVF

Descriptors: *Activated sludge, *Automatic control, *Pilot plants, *Waste water treatment, *Control systems, Water pollution control, Treatment facilities, Effluents, Municipal wastes.

A feed forward control scheme was constructed and demonstrated on a pilot activated studge reactor using as feed the primary effluent from a municipal treatment plant. The control scheme can be used to control both the air and recycle solids rates to the reactor to compensate for the increased carbon level in the feed stream. At normal detention times an improvement in process efficiency was observed with the control scheme. (EPA abstract)

FINDINGS AND RECOMMENDATIONS ON UN-DERGROUND WASTE DISPOSAL. American Water Works Association, New York. Committee on Underground Waste Disposal and

Journal of the American Water Works Associa-tion, Vol 45, No 12, p 1295-1297, December, 1953. 1 ref.

Descriptors: *Water pollution, *Industrial wastes, *Underground waste disposal, Hydraulic gadient, Legal aspects, Flow, Permits, Time.

Considerations are enumerated for industrial waste disposal in underground sources. Industrial groundwater pollution is nationwide. Waste types are natural-artificial brines, phenolic compounds, heavy metal salts, cleaning fluids, picric acid, gasoline-petroleum products, pickling liquors, fruit and vegetable cannery wastes, milk wheys, and cooling water. Pollutant flow is smooth and laminar with velocities of inches or feet/day. Hydraulic gradients influence route and flow times. Industrial water requirements are growing. Groundwater disposal is attractive. Some wastes Groundwater disposal is attractive. Some wastes are toxic. Geologists must appraise aquifer contamination. Preventive pollution measures are needed. Legal considerations are required. Groundwater will provide future needs. Recommendations include identification of areas where groundwater disposal is not possible; permit systems for agencies to control industrial wastes; and provisions for recourse to courts, if needed, to end industrial underground waste disposal. (Narend industrial underground waste disposal. (Nardozzi - AWWA) W72-12796

CHEMICAL CHARACTERIZATION SLUDGES, Missouri Univ., Columbia. R. I. Calkins.

Paper presented at American Water Works Association Meeting, June 7, 1972, Chicago, Illinois. 28 p. 10 fig. 5 tab. 6 ref.

Descriptors: *Filtration, *Sludge, *Water purifica-tion, *Water softening, Water treatment, Magnesi-um, *Waste water treatment. Identifiers: Settled solids, Cake solids, Specific re-sistance, Sludge compaction, Backwash solids.

sistance, Sludge compaction, Backwash solids. Twenty-five water purification, softening, and combined sludges were studied in relation to settled solids concentration, filtration rate, and cake solids. Iron coagulants provided more compact sludge than aluminum coagulants; a catfloc sludge was the heaviest. Increasing magnesium content adversely affects settleability and sludge compaction for iron and aluminum coagulant sludges. Sludges from turbid water attain higher settled solids concentrations than sludges from low turbidity raw water. Specific resistance and filter loadings are determined. Combined softening-purification sludges filter more readily than do pure coagulants. Sludge with specific resistance <10 x 107 sec 2/g filter well. Filter backwash sludges exhibited poor filtering quality. Sludge can be characterized by volumetric techniques by evaluating settled solids in a graduated cylinder. Consideration should be given to combined softening and coagulation processes. Low magnesium softening sludges rapidly reach 60% solids concentration in lagoons. (Nardozzi-AWWA) W72-12798 W72-12798

THE INVESTIGATION OF PRECOAT VACUUM FILTRATION AND NATURAL FREEZING AS A MEANS TO DEWATER ALLUM SLUDGE, Smith and Mahoney, Albany, N.Y. P. F. Mahoney, and W. J. Duensing.

Paper presented at American Water Works Association Meeting, Chicago, Illinois, June 6, 1972. 12 p. 1 fig. 2 tab.

Descriptors: *Dewatering, *Sludge treatment, *Freezing, Landfills, Costs, *Filtration, Sludge, Separation techniques, Waste disposal, *Waste

water treatment.

Identifiers: *Rotary vacuum precoat filtration,
Aluminum hydroxide sludge, Operating parameters, Filtrate quality, Cake solids.

A testing program is described to determine criti-cal parameters to dewater gelatinous aluminum hydroxide sludge economically. The Environmen-tal Protection Agency provided funds for a pilot facility to: demonstrate the technical feasibility of dewatering alum sludge by rotary vacuum precoat dewatering alum sludge by rotary vacuum precoat filtration; determine optimum operating conditions; develop plant scale cost estimates; describe the effect of natural freezing on dewatering of dilute and concentrated sludge mixtures; and determine the optimum maximum layer thickness to be frozen. The rotary vacuum precoat filtration operation is described. The variables studied included sludge solids cake, filter aids, drumspeeds, knife advance rate, filter drum submergence, filter atte, cake moisture, and filtrate quality. Sludge rate, cake moisture, and filtrate quality. Sludge was pumped from the settling basins to a con-stantly agitated feed tank, then to a filter bowl. A stantly agitated feed tank, then to a filter bowl. A 20% cake solids with filtrate quality < 5 JTU was achieved at 5 gal/ft2/hr. The cake can be used as landfill. Polymer conditioning was not beneficial at Albany. Sludge treatment costs are estimated at \$6.05/mg treated water and \$9.25/1000 gal of sludge. A 4 ft. sludge depth was frozen in layers. Good liquid-solids separation was obtained following thawing. (Nardozzi-AWWA)

WATER TREATMENT PLANT WASTE DISPOSAL - ACTION NOW, American Water Works Association Research Foundation, New York. H. A. Faber, and A. D. Nardozzi.

Group 5D—Waste Treatment Processes

Paper presented at the Pennsylvania Section, American Water Works Association Meeting, May 22, 1972, Bushkill, Pennsylvania. 24 p, 11 fig, 3 ref.

Descriptors: *Sludge treatment, *Water treatment, Water purification, Water softening, Pumping, Dewatering, Pennsylvania, Sludge, Wastes, Byproducts, *Waste water treatment.
Identifiers: *Unit processes, Filter washwater, Ion exchange regenerant, By-product recovery.

Sludge and filter washwater treatment considerations for wastes from water purification and sof-tening facilities are discussed. Sludge production and handling were related to sludge types, suspended and dissolved solids removal chemissuspended aim unsolved soluts rend quantitative try, raw water quality, qualitative and quantitative physical-chemical constituents, treatment plant ef-ficiency, and sludge withdrawal methods. Methods to determine solids in filter backwash and total dissolved solids in ion exchange regenerant streams are presented. Potential correlations of raw and treated water parameters to sludge production are given. Other considerations include problems in pumping and gravity flow; unit processes or process sequences under development to dewater or recover by-products; and the work of Pennsylvania water utilities to solve their problems. Two phases of work are described to establish uniform sampling, analysis, and categorization techniques for all types of water treatment plant wastes and evaluate polyelectrolytes for use as primary coagulants, coagulant aids, and sludge conditioning agents. Future research needs, recommendations, and conclusions are enumerated. (Nardozzi-AWWA) W72-12800

CONSIDERATIONS IN LARGE WATER-PLANT

DESIGN,
Detroit Metro Water Dept., Mich.
For primary bibliographic entry see Field 05F. W72-12801

UNDERGROUND WASTE DISPOSAL Underground Surveys, Inc., Rockford, Ill. Sewage and Industrial Waste, Vol 30, No 5, p 669-672, May, 1958. 1 fig.

Descriptors: *Deep wells, *Injection wells, *Industrial wastes, Injection, Testing procedures, Test wells, Costs, *Waste disposal, *Michigan, Statigraphy.
Identifiers: *Rock strata, Waste compatibility,

Fracturing techniques.

The injection of industrial wastes into deep wells is discussed. Porous sandstone formations in Michigan are satisfactory for industrial waste disposal. States have allowed oil refineries, chemical plants, and pharmaceutical plants to use these strata for pumping inorganic and organic industrial wastes. Rock strata testing is urged to measure waste control, prevent contamination of fresh water, and study effect on surroundings. Testing steps include: Fact-finding study of the industrial plant waste; study of underground formation; laboratory compatibility of reaction between waste and receiving strata; drilling of test wells to determine possible reservoirs and barrier effectiveness; and capacity, injection rate, and flow character of wastes. These data give daily capacity, pump pressures needed, extent of waste travel, and safety factors. Systems economics, construction cost, daily maintenance, and depreciation cost can be estimated. Fracturing techniques give an estimated 40 million gallon/acre total storage capacity. Cost data are given. Potential un-derground uses are radioactive wastes, municipal sewage effluent, and fresh water storage. (Nardoz-zi-AWWA) W72-12802

RECYCLING AND REUSE OF FILTER BACKWASH WATER CONTAINING ALUM

SLUDGE, Hackensack Water Co., Weehawken, N.J. P. E. Pallo, B. J. Schwartz, and L. K. Wang. Water and Sewage Works, Vol 119, No 5, p 123-125, May, 1972. 8 tab, 8 ref.

Descriptors: *Water reuse, *Filtration, *Recycling, Water purification, Filters, Cleaning, Coagulation, Sludge, Flocculation, *Waste water treatment.

Identifiers: *Filter washwater, Coagulant aid, Alum dosage reduction, Jar test, Flow equaliza-tion, Dense floc.

The feasibility of directly recycling filter wash-water together with alum sludge to the flash mixer of a conventional water treatment plant, and the possible effects of recycle on effluent quality and sedimentation operation were investigated. Standard jar tests were run on composite samples of filter backwash. Physical and chemical parameters filter backwash. Physical and chemical parameters were determined by Standard Methods and listed. A holding basin was used to equalize the filter kwash water before the washwater with alum sludge was returned to the flash mixer. Backwash water is an effective coagulant aid up to 40% recywater is an effective coagulant and up to 40% receie in reducing color and turbidity. A pH drop caused by recycling aided alum coagulaltion. A 2% recycle reduced alum dosage requirements from 1.2 to 1.0 grains/gallon while maintaining efficiency. Recycling yielded a denser and smaller floc cy. Recycling yielded a denser and smaller noc settling at a faster rate. Based on Imhoff cones, 95% of the sludge was precipitated in 20 minutes by recycling compared to 35 minutes without recycling. Recycling backwash avoids stream pol-lution and reclaims water for reuse. (Nardozzi-AWWA) W72-12805

CRYSTAL-SEED CONDITIONING OF LIME-

-SOFTENING SLUDGE, Auburn Univ., Ala. Dept. of Civil Engineering. R. H. Wynne, Jr.

Journal of the American Water Works Associa-tion, Vol 64, No 5, p 306-309, May, 1972. 4 fig, 2 tab, 8 ref.

Descriptors: *Water treatment, Mixing, Optimiza-tion, *Filtration, *Sludge treatment, Sludge, *Waste water treatment.

Heating the definition of the state water treatment. Identifiers: *Filterability, *Settleability, *Crystal-seeding, Lime-softening, Sludge Volume Index, Specific resistance, Return sludge.

The filterability of sludge produced by softening laboratory-hardened water and the effect of crystal-seeding on the settleability and filterability of this sludge were investigated. The methodologies of synthesizing the hard water and performing jar tests and settleability and filterability evaluations are described. Important variables are crystal-seed dosage, mixing rate, and return-sludge recycle. Sludge filterability was measured by the coeffic periods and extleability by the by the specific resistance and settleability by the sludge volume index. A 200 rpm mixing rate was sludge volume index. A 200 rpm mixing rate was optimum in reducing specific resistance and a 300 rpm rate optimum in reducing the sludge volume index. A 50% return-sludge dosage improved filterability while a 25% return was best for improving settleability. Recycling was beneficial. The specific resistance of the sludge produced ranged from 4.38 x 10 10 - 41.9 x 10 10 m/kg. (Nardozzi-AWWA W72-12806

RAISING AND WATERING A CITY,

Loyola Univ. Chicago, Ill. L. P. Cain.

In: Technology and Culture, vol. 13, no. 3, p. 353-372, July, 1972.

Descriptors: *Sewerage, *Water supply, *Interceptor sewers, *History, *Illinois, *Lake ceptor sewers, Michigan.

Identifiers: *Chicago, *Technological history, *Early engineering.

Few people are aware of the men who pioneered the sanitation systems which were so crucial to ur-banization in the U.S. Ellis Sylvester Chesbrough, banization in the U.S. Ellis Sylvester Chesbrough, a man without any formal education or engineering training, became Chief Engineer of the Chicago Board of Public Works and was responsible for the unique character of the Chicago sanitation system which made possible major urban growth in spite of unfavorable natural topography. In 1855 he prepared the first plan for a comprehenisve sewerage system to be undertaken by a major city in the U.S.; a plan which called for an intercepting saver system emptying into the Chicago River. sewer system emptying into the Chicago River. This plan which required raising the city's building foundations and street levels to secure grade for foundations and street levels to secure grade for proper drainage took years to accomplish and cost more than 10,000,000 dollars. In 1863 Chesbrough proposed his water supply tunnel plan which involved a two mile tunnel out into Lake Michigan sixty-nine feet below lake bottom and with a slope of two feet per mile from the lake end to the shore. Chesbrough's engineering competence in compilation with a sense of accompanie reality inquired ination with a sense of economic reality insured his success in meeting both the water supply and sanitation needs of Chicago. Ironically, today's problems are probably due in part to these techniques which appeared so dramatically in-novative that their declining effectiveness has only recently become evident under current pollution loads. (Cowgill-OWRR) W72-12800

PRIMARY CONSIDERATIONS IN REGIONAL WASTEWATER TREATEMENT PLANNING,
Mississippi State Univ., State College. Water
Resources Research Inst. A. Shindala

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as PB-211 465, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report, Mississip-pi Water Resources Research Institute, State Col-lege, June 1972, 37 p, 3 fig, 10 ref. OWRR A-056-MISS (1).

Descriptors: Waste water treatment, Waste water disposal, "Regional analysis, Systems analysis, "Planning, Optimization, "Management, Treatment facilities, "Water quality control, "Optimum development plans, "Cost analysis.

The concept of regionalization of waste water treatment has been suggested as an effective mean of meeting the water quality goals at a minimum cost. Although economy of scale provides the primary incentive for regionalization, other ad-vantages may be gained. Such advantages may in-clude flexibility in operation, more qualified personnel, and high degree of automation. The selec-tion of an optimal regional plan requires a considerable variety and quantity of information, a great expenditure of time and money and a wide diversity of expertise. The optimal plan provides the least cost system of collection, treatment and disposal of waste water within a region. In this study, the scope of the regional planning problem is defined. Critical factors influencing the selection of the optimal plan are identified and discussed. Several optimization techniques used in selecting the least cost plan are presented. Data needs are described W72-12821

ROTATING DISKS WITH BIOLOGICAL GROWTHS PREPARE WASTEWATER FOR

GROWINS PREPARE WASTEWATER FOR DISPOSAL OR REUSE, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Sciences. W. N. Torpey, H. Heukelekian, A. Kaplovsky,

and R. Epstein. J Water Pollut Control Fed. Vol 43, No 11, p 2181-

2188. 1971. Illus. Identifiers: Water reuse, *Waste water treatment,

*Biological treatment, Algae, Biochemical oxygen

demand, Disks, Waste water disposal, Nitrogen, Oxygen, Phosphorus,.

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Wastewater is treated sequentially on a series of rotating disks with attached biological growths, on a series of rotating illuminated disks with attached a series of rotating illuminated disks with attached algae growths and by activated carbon if desired. Treating primary effluent by these means resulted in the removal of 95% of the carbonaceous biochemical oxygen demand and oxidation of NH3 to NO3. Further work was done on N and P removal from the effluent by this treatment scheme; this involves promoting growth of attached filamentous algae on illuminated rotating disks. The disks are made of aluminum.—Copyright 1972, Biological Abstracts, Inc. W72-12910

FULL SCALE CONVERSION OF ANAEROBIC DIGESTERS TO HEATED AEROBIC DIGESTERS.

Waste Water Treatment Plant, Ohio.

Available from the National Technical Informa-tion Service as PB-211 448, \$3.00 in paper copy, \$0.95 in microfiche. Environmental Protection Agency Report No. EPA-R2-72-050- (August 1972), June 1972, 58 p, 5 fig, 3 tab, 4 ref, 3 append. EPA Program 17070 DIW WPRD 187-01-68.

Descriptors: *Waste water treatment, *Anaerobic digestion, *Odor, Pilot plant, Sludge treatment, *Ohio, *Aerobic treatment, *Sludge digestion,

*Heat treatment.

Identifiers: *Thermophilic digestion, Nuisance odor, *Hamilton (Ohio).

Full plant scale experiments were made to determine the effect of heated aerobic digesters on digestion of waste water treatment plant sludge. Existing heated, floating cover equipped, anaerobic digesters, which had failed under excessive paper mill waste discharge, were converted to this purpose by addition of blower supplied air. The program contemplated phase experiments over a wide range of varying time, loading, air rate, and temperature conditions. Excessive odor production as temperature descriptions. tion as temperatures increased prevented conclu-sion of the total program or any single phase. No practical method for control of temperature resultant from bacterial energy exerted in volatile reduction could be devised. The experiment was beneficial in determing the extent of practical ap-plication, and in establishing that thermophilic digestion temperature ranges could have produced significant volatile reduction. Determinations made also afford a measure of energy (heat) generated by aerobic bacteria in destruction of waste. Cost analysis is not available from limited waste. Cost analysis is not available from inflied scope (excepting conversion contract price), but initial installation appears unattractive. Conver-sion of existing facilities, however, could reflect savings. (EPA abstract) W72-12922

THE VORTEX CHAMBER AS A GRIT REMOVAL DEVICE FOR WATER TREAT-

Clemson Univ., S.C. Water Resources Research Inst.

For primary bibliographic entry see Field 05F. W72-12946

NEW PROCESS CONVERTS CATTLE RUMEN TO FEEDSTUFF, D. Natz.

Feedstuffs, Vol 43, No 28, July 10, 1971. 1 fig.

Descriptors: *Farm wastes, Cattle, Suspended solids, *Waste treatment, *Feeds.
Identifiers: Feeding trials.

A practical means of turning rumen content (paunch) of slaughtered cattle into a valuable feed

ingredient is claimed by Dr. Paul A. Stahler, a Minnesota medical doctor. The patented 'Stahler Conversion Process' actually converts the paunch material into two usable feed ingredients. One is a concentrated liquid fed to hogs as a top dressing over grain. The other is a dehydrated product which is fed to cattle much like silage. Stahler's process first separates the liquids and solids by suction, then compresses the high moisture solids to extract more liquid. The liquids then go into a holding for sterilization and processing. The solids move into a revolving drum-type heating and drying unit where they are exposed to 2000 to 3000F temperatures. The solids can then be pelleted if desired. Stahler reported that the paunch, when processed according to the prescribed methods, will provide a minimum of 75% of the commonly accepted nutritive requirements of beef cattle during the finishing phase. He said that it has even more potential as a pre-finishing ration - from about 400 to 800 pounds. The cost to produce this material in 1960 was about \$17.04 per ton. During feeding trials conducted by Stahler, cattle gained an average of 2.5 pounds per day on a ration of which a major part was paunch products. Stahler predicted that beef production nationally could be increased by 25% by utilizing the rumen content of animals as a feed product. (Wallin-Iowa State) W72-12947

MANAGEMENT PRINCIPLES APPLICATION TO THE DISPOSAL OF CATTLE MANURE TO PREVENT POLLUTION, Washington State Univ., Pullman. Coll. of En-

neering Research Div. D. E. Proctor.

Paper presented at the Eighth Texas Industrial Water and Wastewater Conference, Lubbock, Texas, June 6, 1968. 13 p, 1 fig.

Descriptors: *Farm wastes, Dairy industry, *Waste disposal, Confinement pens, Runoff, *Washington, Aerobic treatment, Lagoons. Identifiers: Anaerobic lagoons, *Monroe (Wash).

The Sanitary Engineering Section of the College of Engineering Research Division was asked to con-Engineering Research Division was asked to consider the manure problem at a dairy and milk processing plant near Monroe, Washington. Winter flooding and cost were two problems that influenced the systems set up for the 230 to 240 cows. The final system consisted of scraping and flushing the manure into a central slurry sump. From here the manure can either be pumped to the fields for discord through manure. rrom here the manufer can either be pumped to the fields for disposal through a manure 'gun' or pumped to one of three storage lagoons. Each lagoon measures 115 feet by 115 feet by 18 feet and all three can hold about 430,000 cubic feet of material. (Wallin-Iowa State)

WASTE WATERS FROM FARMS.

Department of Scientific and Industrial Research, Notes on Water Pollution No. 17, June, 1962, 4 p, 11 ref.

Descriptors: *Farm wastes, Irrigation, *Waste disposal, Biochemical oxygen demand, Nitrogen, Biological treatment, *Waste water treatment. Identifiers: *Soakaways.

Disposal of waste waters from farms has become a major problem as farmers have turned away from bedding down animals. Methods of disposal suggested include irrigation on land, soakaways, discharge to a sewer, and biological treatment and discharge to a stream. Silage liquor, herbicides, and pesticides all create a disposal problem. Consulting the local water quality authorities is usually the best procedure before attempting to dispose of liquors capable of water pollution. (Wallin-Iowa State) W72-12949

DISPOSING OF ANIMAL WASTES, Washington State Univ., Pullman. D. O. Turner. Crops and Soils Magazine, p 10-11, February 1971.

Descriptors: Farm wastes, Dairy industry, Lagoons, Fertilizers, Runoff, Waste disposal, *Washington, *Waste treatment, Water reuse. Identifiers: Urban expansion.

Handling wastes from dairy and beef operations is difficult. In Washington, a system was designed to handle the wastes from approximately 400 dairy cattle. The location was an alluvial flood plain which was subject to frequent and severe winter flooding. The wastes from the herd were scraped and flushed to a transfer pump where they could go directly to the fields or to the two winter storage lagoons, each of which have a capacity of one million gallons. Waste material from the lagoon was transported through a pipeline and applied to silage corn and ryegrass with a sprinkler. Application was limited because of a thatch from by the fiber content of the manure which allowed surface runoff. Current recommendations are that dairymen should have one acre of disposal land for every two cows. (Bundy-Iowa State)

WASTEWATER TREATMENT FACILITIES FOR A POLYVINYL CHLORIDE PRODUCTION PLANT.

Goodrich (B. F.) Chemical Co., Cleveland, Ohio. Environmental Control Dept.

Copy available from GPO Sup Doc EP 2.10:12020 DJI 06/71, \$1.00; microfiche from NTIS as PB-211 464, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, June 1971, 73 p, 9 fig, 24 tab, 12 ref. EPA Program 12020 DJI 06/71.

Descriptors: *Industrial wastes, *Chemical wastes, *Activated sludge, *Treatment facilities, *Waste water treatment, Equalization, Reservoirs, Flocculation, Sedimentation, Nutrient requirements, Sludge treatment, Centrifugation, Automatic control laboratory tests, Pilot plants,

*Water reuse.

Identifiers: *Polyvinyl chloride, Process monitoring, Mechanical aeration, Sludge thickening.

B. F. Goodrich Chemical Company has completed construction and has begun operation of a new polyvinyl chloride (PVC) production plant that includes emulsion, suspension, and bulk polymerization processes. The wastewater treatment system for this plant was designed to meet polymerization processes. The wastewater treatment system for this plant was designed to meet the stringent discharge requirements of both the State of New Jersey and the Delaware River Basin Commission. The wastewater treatment system consists of a primary-secondary completed mixed activated sludge process including equalization, flocculation, clarification, mechanical aeration, nutrient addition, sludge thickening and centrifugation, and automatic process monitoring. Although the company operates several PVC production plants in the United States, none of these plants could be considered to be a duplicate of the proposed production plant. Therefore, it was necessary to simulate the anticipated production plant wastes by selective sampling of the laboratory and pilot plant studies and a complete and detailed description of the full-scale wastewater treatment system was constructed. Actual operations and unit process performance. Evaluation of a full-scale wastewater recycle and reuse system was included. (Galwardi-Texas) W72-12958

APPLICATION OF ROTATING DISC PROCESS TO MUNICIPAL WASTEWATER TREAT-MENT, Autotrol Corp., Milwaukee, Wis. Bio-Systems

Group 5D—Waste Treatment Processes

R. L. Antonie, and F. J. Koehler. Copy available from GPO Sup Doc EP 2.10:17050 DAM 11/71, \$0.75; microfiche from NTIS as PB-211 463, 50.95. Environmental Protection Agency, Water Pollution Control Research Series, November 1971, 74 p, 29 fig, 7 tab, 12 ref. EPA Program 17050 DAM 11/71.

Descriptors: *Waste water treatment, *Biological treatment, "Municipal wastes, Biochemical oxygen demand, Performance, Nitrification, Ammonia, Sedimentation, Temperature, "Wisconsin,

Suspended solids.
Identifiers: *Rotating disc process, Rotating biological contactor, Sludge recycle, *Pewaukee

A prototype package plant incorporating the rotating disc wastewater treatment process was tested on municipal wastewater at the Village of Pewaukee, Wisconsin, to evaluate its treatment capabiliand establish guidelines for operation and testing of a full-scale rotating disc demonstration plant soon to be put into operation at Pewaukee. The package plant included a rotating bucket feed mechanism, ninety-one 1.75 meter diameter discs divided into two stages, and a secondary clarifier with a sludge-removal mechanism. Variables tested included hydraulic loading, rotational disc speed, sludge recycle, and wastewater treatment as it varied with climatic conditions. At a hydraulic loading of 1.5 gpd/ft2 of disc surface, the package plant achieved 87% removal of BOD and 80% removal of suspended solids to yield an effluent of 20 mg/l BOD and suspended solids when treating effluent from the existing primary clarifier. At the same loading, 85% removal of ammonia nitrogen was obtained to yield an effluent of 3.5 mg/l. (Galwardi-Texas) W72-12959

INVESTIGATION OF RESPONSE SURFACES OF THE MICROSCREEN PROCESS, Engineering-Science, Inc., Cincinnati, Ohio. T. G. Shea, and R. M. Males.

Copy available from GPO Sup Doc EP 2.10:17090 EEM 12/71, \$1.25; microfiche from NTIS as PB-211 451, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971, 142 p, 29 fig, 30 tab, 6 ref, 4 append. EPA Program 17090 EEM 12/71. Contract 14-12-819.

Descriptors: *Tertiary treatment, *Filters, *Pilot plants, *Computer models, Computer programs, Design data, Activated sludge, Trickling filters, Oxidation lagoons, Effluents, Performance, *Waste water treatment, *Particle size. Identifiers: *Microscreens, Microstrainers, Screen sizes, Screen types, Particle size distribu-

tion, Backwash system.

Field, laboratory, theoretical, and state-of-the-art studies were conducted with regard to utilization of microscreens for tertiary treatment applica-tions. Field studies were conducted with two pilot microscreen units, using a variety of screen sizes and types, for activated sludge, trickling filter, and oxidation pond effluents. Particle size distribution of the effluents (microscreen influents) were found to be the key characterizing parameter in determination of treatment effectiveness. Overall effectiveness of solids removal was low, and was ascribed to deficiencies in microscreen design practice for the transfer of screened solids from the screen to the backwash system and out of the microscreen unit. A computer model of the process was developed in a format compatible with the EPA Executive Program for Optimization of Treatment Systems. (Galwardi-Texas) W72-12960

PHYSICAL-CHEMICAL TREATMENT OF MU-NICIPAL WASTEWATER, Environmental Protection Agency, Washington,

D. F. Bishop, T. P. O'Farrell, and J. B. Stamberg.

Water Pollution Control Federation Journal, Vol 44, No 3, March 1972, p 361-371, 3 fig, 8 tab, 22 ref.

Descriptors: *Lime, *Chemical precipitation, *Ac-Descriptors: *Lime, *Chemical precipitation, *Activated carbon adsorption, Filtration, Ion exchange, Municipal wastes, *Waste water treatment, Efficiencies, Nitrogen, Organic matter, Phosphorus, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Estimated costs, Pilot plants, Tertiary treatment. Identifiers: Total organic carbon, *Combined treatment.

Physical-chemical treatment consisting of two-Physical-chemical treatment consisting of two stage lime precipitation with intermediate recar-bonation, filtration, pH control, selective ion exchange, and carbon adsorption removed ap-proximately 95% of the TOC, BOD, and COD, 97% of suspended solids, 98% of total phosphorus, and 78% of total nitrogen from District of Columbia raw wastewater in pilot plant studies recently completed. Residuals averaged 6 mg/l TOC, 5 mg/l BOD, 13 mg/l COD, 5 mg/l suspended solids, 0.15 mg/l phosphorus and 4.6 mg/l nitrogen. Lime precipitation removed about 80% of the organics, 91% of the suspended solids, 97% of phosphorus, and 31% of the nitrogen. Ion exchange and adsorption were helpful in removing ammonia nitrogen and organics, respectively. However, filtration increased removals only slightly. The estimated water costs for physical-chemical treatment with solids disposal in a 300 mgd plant was \$0.32/1000 gallons. (Galwardi-Texas)

SEWAGE EFFLUENT TREATMENT FOR WATER RECOVERY, J. G. Slack.

Effluent and Water Treatment Journal, Vol 9, No 5, May 1969, p 257-261, 8 tab, 5 ref.

Descriptors: *Reclaimed water, *Sewage effluent, *Organic matter, *Phosphates, *Chemical precipitation, Nitrates, *Activated carbon, Chemical oxygen demand, Total costs, *Sludge treat-ment, Vacuum drying, *Waste water treatment. Identifiers: Alum, Powdered activated carbon,

The treatment of sewage effluent to a standard comparable to that of the River Chelmer water at summer flows, in terms of dissolved organic matter and phosphate is described. The treated effluent would be used to augment the flow of water in the River Chelmer during summer months. when the flow can be as low as 5 mgd. A fractional increase of sulfate anc chloride levels in the river water would result. However, the volume of ef-fluent discharged would need to be controlled in relation to river flow to ensure that the nitrate content did not exceed a predetermined level. Reduction in phosphate concentrations from 17.25 ppm as PO4 to less than 2 ppm PO4 would be requ along with the reduction of COD to less than 15 ppm. These reductions were accomplished by coagulation with 100 to 150 ppm of alum in the presence of 250 ppm of activated carbon powder. Alum coagulation was improved by the presence of the carbon and there was no loss of the adsorptive capacity of the carbon in the presence of the aluminum hydroxide. The presence of carbon did not interfere with phosphate precipitation by alum and there was no residual aluminum in the recovered water. The sludge produced was readily dewatered by vacuum filtration. Total costs were estimated at 25 d per 1000 gallons. (Galwardi-Tex-W72-12962

WATER IN AGRICULTURE - ITS USE AND REUSE, E. G. Coker.

Effluent and Water Treatment Journal, Vol 9, No 10, October 1969, p 553-557, 1 tab, 27 ref.

Descriptors: *Water reuse, *Irrigation water, *Sewage effluent, Agriculture, Sodium, Heavy metals, Hardness (Water), Nutrients, Livestock, Liquid wastes, Fertilizers, Sludge digestion, *Sludge disposal, Waste disposal. Identifiers: Liquid manure, Liquid digested sludge, *United Kingdom.

The present irrigation practices and the limit of irrigation development in the United Kingdom were discussed. It was estimated that 160,000 acres were irrigated and that up to 1.5 million acres could eventually be irrigated. The use of sewage effluents in agriculture was reviewed. The mineral contamination of the water is the most important factor which limits the reuse value of sewage effluents. The safe concentration of sodium in sewage effluents used for crop irrigation depends on the total hardness of the water for if sodium forms more than 10-12% of the attached ions, the soil becomes difficult to work. Results from questionnaires showing average effluent analyses of nutrients, hardness and heavy metals were arranged in tabular form. The amount of water used by farm animals was estimated at 200 mgd. The production of liquid manures has increased greatly and the use of these manures to replace conventional soluble inorganic fertilizers was discussed.

Also, the use of liquid digested sludge as a fertilizer was compared to the use of air-dried sludge. (Galwardi-Texas) W72-12964

FREEZING AND THAWING AS A TECHNIQUE FOR IMPROVING THE DEWATERABILITY OF AQUEOUS SUSPENSIONS, Water Pollution Research Lab., Stevenage (En-

gland).

R. C. Baskerville. Filtration and Separation, March/April 1971, (Water Pollution Research Laboratory Reprint No. 616), 4 p, 10 fig, 2 tab, 5 ref.

Descriptors: *Sludge treatment, *Dewatering, *Freeze-thaw tests, *Filtration, Resistivity, Laboratory tests, Shear, Dissolved solids, Chemical properties, *Waste water treatment. Identifiers: Organic sludges, Inorganic sludges, *United Kingdom.

Freezing and thawing as a technique for conditioning sludge prior to dewatering has been practiced in the United Kingdom to a limited degree. The effectiveness of this process has been evaluated in the laboratory for a range of sludge types by measuring the improvement in filterability and resistance of the conditioned sludge to shear forces. The process is not very suitable for conditioning organic sludges as the sludge flocs are very fragile unless an inorganic conditioner is also used. For inorganic sludges (the hydroxides or oxides of aluminum, iron and titanium) this technique is admirable, provided the dissolved solids content of the liquor is low. There is some indication that the effectiveness of this technique may also be dependent upon the chemical composition of the suspension. (Goessling-Texas) W72-12965

USE OF ALGAL ASSAYS IN STUDYING

EUTROPHICATION PROBLEMS,
National Environmental Research Center, Corvallis, Oreg. National Eutrophication Research Program. For primary bibliographic entry see Field 05C.

W72-12966

CHLORINATION - A HISTORICAL SURVEY, For primary bibliographic entry see Field 05F.

INACTIVATION OF VIRUSES,
Royal Veterinary and Agriculture Coll.,
Copenhagen (Denmark). Dept. of Virology and
Immunology.
For primary bibliographic entry see Field 05F.

CANNERY WASTE DISPOSAL ON LAND, CANDERY WASHE DISPOSAL ON LAND, Guelph Univ. (Ontario). Dept. of Soil Science. R. T. Heywood, T. Stevens, and L. R. Webber. Canadian Journal of Soil Science, Vol 49, p 211-218, 1969, 3 fig, 4 tab, 13 ref.

Descriptors: *Industrial wastes, *Canneries, *Spraying, *Irrigation, Efficiency, *Chemical oxygen demand, Organic loading, Loam, Silts, Soil moisture, Moisture tension, Effluents, Performance, Laboratory tests, *Waste disposal, *Waste water treatment. Identifiers: *Corn wastes, Canada, Field tests.

Field and laboratory trials were used in attempts to relate soil moisture tension and the efficiency of a silt loam soil to oxidize the organic material in cannery corn waste. The organic loading in the waste was expressed as chemical oxygen demand. With a daily loading at the rate of 360 kg COD/ha, the effluent showed an 87% loss in COD compared with an 80% reduction at a rate of 490 kg COD/ha. However, evidence indicated that the backfill over the field tiles had not settled adequately and the waste was not retained long enough by the soil to facilitate oxidation. With laboratory trials using the miscible displacement technique, 97% of the COD was removed at soil moisture tensions of 45 and 100 cm of water. (Galwardi-Texas)

LOW COST METHODS OF WASTEWATER TREATMENT.

Water Science Labs., Melbourne (Australia). C. D. Parker.

Preprint, presented at 6th International Water Pollution Research Conference, Session 3, Hall B, Paper No. 5, June 20, 1972, 8 p, 1 tab, 17 ref.

Descriptors: *Waste water treatment, *Irrigation, Lagoons, *Ditches, *Oxidation lagoons, Municipal wastes, Industrial wastes, Design criteria, Performances, Coliforms, Public health, Costs. Identifiers: *Pasveer oxidation ditch, Anaerobic lagoons, Facultative lagoons, Aerobic lagoons, Maturation ponds, *Australia.

Three low cost methods of wastewater treatment, irrigation, lagoons, and oxidation ditches were discussed. The largest existing irrigation scheme for the treatment and disposal of sewage, located at Werribee in Victoria, Australia, consists of 27,000 acres which is used to purify the sewage from the City of Melbourne which has a population of 2.3 million. An analysis of drainage water compared with the irrigated raw sewage was presented in tabular form. Design criteria and performance of various types of lagoons, anaerobic, facultative and aerobic were presented. In order to achieve reduction in the faecal coliform count, a detention time of 7-10 days was suggested for maturation ponds. The Pasveer oxidation ditch was an effective low-cost means of applying the activated sludge process where moderate areas of land are available and structural appearance is not important. Most of these low-cost treatments by proper consideration of microbiological nutrition and physiology can be adapted to the treatment of a wide variety of organic industrial wastewater. (Galwardi-Texas)

EFFLUENT PRETREATMENT FOR COASTAL DISCHARGE,

M.W. Askew. Effluent and Water Treatment Journal, Vol 10, No. 4, April 1970, p 193-202, 4 fig, 13 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Trickling filters, Settling basins, Estuaries, Estimated costs, Plastics, Flow rates, Fluctuations, Population, Organic loadings, Biochemical oxygen demand, Suspended solids, *Waste

Identifiers: *Effluent pretreatment, *Coastal discharge, Filter media, Flocor, *United King-

Comparatively little attention has been paid to estuarial and coastal pollution, despite the fact that 10% of all domestic sewage, some 250 mgd has been discharged untreated to such waters of the United Kingdom. The pollution of beaches and inshore waters by sewage solids has been most obvious in the popular holiday resorts, where sewage disposal systems, often barely adequate for the resident population, have become severely strained. Two wastewater treatment facilities utilizing highrate biofiltration schemes were described. Biological filters using a plastic media, Flocor, have been shown to be capable of handling load variations originating from seasonal population fluctuations. Design loadings were 6 to 7 lb BOD/y3/day and have been met. Estimated costs for a design population of 300,000 at a flow of 50 gphpd using biofilters and sedimentation would be some 550,000 pounds. (Galwardi-Texas)

PLANT CUTS WATER USE, EASES POLLU-

Environmental Science and Technology, Vol 6, No. 7, July 1972, p 594-595.

Descriptors: *Pollution abatement, *Industrial wastes, *Water reuse, *Recirculated water, Settling basins, Sedimentation, Hydrogen ion concentration, Neutralization, Aeration, Sulfides, *Missouri, *Waste water treatment, *Tannery wastes. Identifiers: Tanning industry, *St. Joseph (Mo).

The Blueside Co. at St. Joseph, Missouri, the newest plant in the tanning industry is designed to be pollution-free and is equipped with the best available pollution control technology. Both unhairing and tanning processes are performed at the plant. The new plant uses only 1.0-1.5 gallons of water per pound of hide compared to some older tanneries which may use 40-50 gallons of water per pound of hide. The wastewater treatment system consists of a 60 ft. diameter holding tank which solids are removed from both the top and bottom. The effluent is neutralized from a pH of 9.0 down to a pH of 5.5 and aerated to remove sulfides. The sulfide-laden airstream is further treated with caustic to recover the sulfide as sodium sulfide for reuse in the unhairing process. In addition all wastewater streams are available for individual recycling. (Galwardi-Texas)

TREATMENT OF AGRICULTURAL WASTES,

E. R. E. Briscoe. Effluent and Water Treatment Journal, Vol 9, No. 8, p 439-446, August 1969, 3 tab, 10 ref.

Descriptors: *Waste water treatment, Agriculture, Elivestock, *Crop production, *Oxidation, Lag-goons, Ditches, Irrigation, Biochemical oxygen demand, Efficiencies, Hydrogen ion concentration, Suspended solids.

Oxidation ditches, Vegetable washing, United

Kingdom, Spray irrigation.

Various methods for the treatment of agricultural wastes were reviewed. The agricultural industry was divided into two main sections, livestock, and crop production, and the approximate proportions of main agricultural products expressed as a per-centage of the total industry were presented in tabular form. Results of analysis of samples from an oxidation ditch followed by liquors for treating livestock wastes were also arranged in tabular form. Results showed over 90% removal of both BOD and suspended solids. A table which showed approximate vlaues of biochemical oxygen de-mand and suspended solids expressed in lb/ton of processed product, and the pH of wastes from processed product, and the PH of wastes from vegetable washing was also presented. The use of irrigation in connection with slurry disposal has had limited application in the United Kingdom and requires up to as much as 6 acres per 1,000 gallons/day if the soil structure is not to be permanently damaged. (Galwardi-Texas) W72-12974

RAYCYCLE CUTS SULFITE PULP POLLU-

Environmental Science and Technology, Vol 6, No. 7, July 1972, p 596-597, 1 fig.

Descriptors: *Industrial wastes, Pulp and paper industry, *Pulp wastes, *Pollution abatement, *Waste water treatment, Incineration, Biochemical oxygen demand, Chemical oxygen demand, Foaming, Efficiencies, Total costs, Estimated costs, Laboratory tests, *Water reuse. Identifiers: *Chemical recovery, Soda-base cycle, Total organic carbon.

ITT Rayonier has developed a process that will reduce the BOD load from 1100 lb/ton to 120 lb/ton of air dried product at its Fernandina Beach, Florida sulfite pulp mill. The process change involved switching from an ammonia-based cooking cycle to a soda-based cycle. The washing step between digestion and the hot caustic bleaching stage was eliminated at a savings of 3-5 mgd depending on the type of pulp. Thus wastes from both the digestion stage and bleaching stage can be combined, concentrated and incinerated with chemical recovery of the ash. The process has been successfully tested under laboratory conditions. Reductions of 95% were reported for TOC and COD and 90% for color. Also, foaming from mill effluent was eliminated as the foam causing materials will be burned in the recovery furnace. Total cost of the process was estimated at \$38 million. (Galwardi-Texas) W72-12977

SEWAGE DISPOSAL IN REFORMED LOCAL GOVERNMENT, For primary bibliographic entry see Field 05G. W72-12978

BIOFILTRATION TECHNOLOGY - PART L

M. W. Askew.
Effluent and Water Treatment Journal, Vol 9, No. 10. p 547-552, October, 1969, 2 fig, 1 tab, 13 ref.

De criptors: *Trickling filters, *Biological treatment, *Plastics, Organic loadings, Flow rates, Biochemical oxygen demand, Design criteria, Dewatering, Pathogenic bacteria, Capital costs, Efficiencies, *Waste water treatment. Identifiers: *Biofiltration, Plastic packings, Flocor, United Kingdom, Settling characteristics.

The role of plastic as packings in the high-rate biofiltration process in the United Kingdom was discussed. The minimum rate of irrigation for uniform wetting of the available surfaces of Flocor was stated to be 0.5 gallons/ft2 cross-section/minute. The maximum operating weight of a Flocor system was taken for design purposes as being 15 lb/ft3 compared with the dry weight of the packing of 2.2 lb/ft3. The system has been shown to be independent of bed depth at given loads of to be independent of oed depth at given rouss of BOD/unit volume. Flooor systems have been found to show a BOD removal/sludge conversion of the order of 20 to 30% for both soluble and in-soluble substrates. BOD loads of 5 blyd/3/day for high-rate biofilters compared with 0.15 - 0.2 lb/yd3/day for conventional percolating filters

Group 5D—Waste Treatment Processes

have greatly reduced spacial requirements. Highrate biofiltration systems were reported as having capital costs of the order of 2 pounds per head of population served compared to 10-33 pounds per head for conventional plants. Results showing reductions of pathogen indicator organisms were presented in tabular form. (See also W72-12981) presented in tabu (Galwardi-Texas)

BIOFILTRATION TECHNOLOGY-CONCL-USION, M. W. Askew

Effluent and Water Treatment Journal, Vol 9, No. 11, p 611-617, 2 fig, 1 tab, 1 ref, November 1969

Descriptors: *Biological treatment, *Trickling fil-ters, *Industrial wastes, *Plastics, Performance, Biochemical oxygen demand, Efficiencies, Milk, Textiles, Settling basins, Pretreatment, Hydrogen ion concentration, Nutrients, Cost comparisons,

*Waste water treatment.
Identifiers: *Biofiltration, Plastic packings,
Flocor, *United Kingdom, Distillery wastes, Fruit and vegetable processing wastes.

Several industrial applications of high-rate biofil-tration were presented. More than 60 industrial high-rate biofilter plants of various sizes have been constructed in the United Kingdom during the past 5 years. The wide diversity of application of the system was exemplified by the duties of those plants, which ranged from treatment of very strong wastes to 850 mg/1 BOD prior to discharge to municipal sewers, to the recovery of water of sufficiently high quality for re-use in the food industry. The performances of some existing plants treating distillery, fruit and vegetable, milk processing and textile industry wastes were presented. Pretreatment including solids sedimentation, pH and nutrient balance adjustment may be required depending on the industrial application. Greater than 90% removal of BOD was reported in most cases. A cost comparison, showing a savings of \$143,000, between high-rate biofiltration and conventional percolating filtration was presented in tabular form. (See also W72-12980) (Galwardi-Texas) W72-12981

USE AND RE-USE OF WATER AND EF-FLUENTS IN THE MOTOR INDUSTRY-PART ONE.

Effluent and Water Treatment Journal, Vol 9, No. 12, p 655-659, December 1969, 2 fig, 1 tab, 2 ref.

Descriptors: *Water conservation, *Water reuse. *Effluents, *Industrial wastes, Cooling water, Domestic water, Performance, Water costs, Waste water treatment.

Identifiers: Automobile industry, England, Process water

Water usage, re-use and effluents from motor assembly and the metal finishing processes in the motor industry were discussed. Water usage and associated trade effluents in relation to car production were illustrated. Several examples of water conservation practices for cooling waters, domestic water and process waters were presented. These included introduction of closedcircuit cooling systems, private cooling towers, or even heat exchange with refrigeration. Also, water used for filling radiators and tank testing were diverted as make-up water for such systems in-stead of being wasted. Savings in domestic water consumption can be realized by retiming of auto-matic flushing systems, introduction of springloaded taps and the introduction of Consta-flow restrictors on main feeds to regulate the high pressures which accrue when other processes are shut down. Reductions of 40-80% of process waters were reported by elimination of flows not required during non-production hours and the introduction of counter-current rinsing. (See also W72-12983) (Galwardi-Texas) W72-12982

USE AND RE-USE OF WATER AND EF-FLUENTS IN THE MOTOR INDUSTRY-CO-NCLUSION, V. H. Lewin.

Effluent and Water Treatment Journal, Vol 10, No. 1, p 39-45, January 1970, 3 fig, 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Water resue, *Ion-exchange, *Industrial wastes, Solvents, Water conservation, Treatment facilities, Operating costs.

Identifiers: Automobile industry, Electroplating processes, Painting processes, Cutting oils, Boiler blowdown. Chlorinated hydrocarbon advents blowdown, Chlorinated hydrocarbon solvents, Oxford, England.

Treatment methods for wastewater effleunts associated with the motor industry were discussed. An example of treatment of wastewater from electroplating processes by ion-exchange was presented. The system included a cation exchange resin bed followed by a mixed resin bed with the treated water being recirculated. Water consumption was reduced from 125,000 gallons per day to 10,000 gallons per day. Typical analyses of the ef-fluent from the treatment plant were presented in tabular form. Two flow diagrams illustrating water consumption and effleunt production associated with painting were also presented. Other effleunts discussed included cutting oils which form water-based emulsions, boiler blow down, and chlorinated hydrocarbon solvents. Operating costs of ion-exchange systems were reported at 11s 2d per 1000 gallons while sewage treatment costs at Oxford were reported to be 1s 9d per 1000 gallons with charges being based on a modified Mogden type formula. (See also W72-12982) (Galwardi-W72-12983

SEWAGE FROM THE TAP-PART I,

Loughborough Univ. of Technology (England). Dept. of Civil Engineering. J. A. Pickford

Effluent and Water Treatment Journal, Vol 9, No. 9, p 501-505, September 1969.

Descriptors: *Water resue, *Sewage treatment, *Effluents, *Costs, Industrial water, Agriculture, Nitrates, Groundwater recharge, Water costs, Water consumption, *Waste water treatment. Identifiers: Great Britain.

Papers and related discussions presented at the second Public Health Conference at Loughborough University of Technology were reviewed and summarized. The main topic of the conference was tertiary sewage treatment and water reuse. Related topics included: discharges and the receiving river, nitrate concentrations, quantity of water resue, water reuse in industry and agriculture, groundwater recharge and water reuse costs. Over 25% of the population of Britain derives its drinking water from raw waters to which sewage effluents have been discharged. The cost of water for industrial reuse was stated at 9d per thousand gallons and even if treatment costing 6d per 1000 gallons was required the total cost would be about one third the cost of water from public water supply systems. (See also W72-12985) (Galwardi-Texas) W72-12984

SEWAGE FROM THE TAP-CONCLUSION, Loughborough Univ. of Technology (England). Dept. of Civil Engineering. J. A. Pickford.

Effluent and Water Treatment Journal, Vol 9, No. 10, p 559-562, October, 1969, 1 fig. 7 ref.

Descriptors: *Tertiary treatment, *Sedimentation, *Biochemical oxygen demand, Lagoons, *Filtration, Efficiencies, Performance, Flow rates, Bacteria, Effluents, Estimated costs, *Waste water treatment, Suspended solids. Identifiers: *Great Britain, Microstrainers, Sand filtration, Loading rates, Pebble-bed clarifiers.

Papers and related discussions presented at the second Public Health Conference at Loughborough University of Technology were reviewed and summarized. Tertiary treatment processes in Britain have been designed for the removal of suspended solids and their associated BOD. Unit processes utilized have been settlement in lagoons, static filtration as in sand filters and mechanical filtration as in microstrainers. Grass plots in which a combination of settlement and filtration takes place have also been used. Lagoons with a retention time of 17 days gave a final discharge containing only 3 mg/1 suspended solids. Grass plots when loaded at 1 m3/m2/day removed 76% of the suspended solids and 55% of the BOD. Rapid sand filters have yielded 70-80% removal of suspended solids at flow rates ranging between 118 and 235 m3/m2/day. Two new types of rapid sand filters were discussed, the Immedium and the Simater filters. The Immedium has dealt with flows up to 470 m3/m2/day reducing a suspended solids concentration of 17 mg/1 to 9 mg/1. At a rate of 300 m3/m2/ day the 17 mg/1 concentration was reduced to 5 mg/1. Reduction of 50-60% of the suspended solids was accomplished by a pebble-bed clarifier using 5-10 mm medium and a flow rate of 24 m3/m2/day. Bacterial reductions from secondary effluents in the above methods were also reported. Estimated costs for tertiary treatment ranged from 6 to 20% of conventional primary and secondary treatment. (See also W72-12984) (Galwardi-Texas) W72-12985

PERMASEP PERMEATORS IN INDUSTRIAL WASTE STREAM SEPARATIONS, Du Pont de Nemours (E.I.) and Co., Wilmington,

Del.

W. P. Cooke.
Effluent and Water Treatment Journal, Vol 10,
No. 2, p 89-96, February 1970, 6 fig, 4 tab.

Descriptors: *Reverse osmosis, *Industrial wastes, *Pulp wastes, Design criteria, Design data, Pressure, Temperature, Selectivity, Pulp and paper industry, Performance, Efficiencies, Hydrogen ion concentration, *Waste water treat-

Identifiers: Hollow fiber membrane, Nylon, Undissolved solids, Sugar molasses,

The use and advantages of hollow fibers as semipermeable membranes were reviewed. A specially developed nylon by DuPont was the first hollow fiber ready for permeator commercialization in the field of aqueous separations because of its exceptional strength and its durability in saline solutions. Permeator design and specifications were outlined. Performance parameters such as pressure, temperature, undissolved solids, conversion ar pH were discussed. A practical upper limit of 40C, at 600 psig feed pressure, was dictated by the epoxy tube sheet. By variations in their manufacturing process, DuPont was able to produce hollow fibers with a range of permeation characteristics. However, increased capacity was gained only at the expense of selectivity. Several industrial waste applications including whey processing, pulp mill waste stream processing and sugar refinery molasses processing were illustrated. Test results were arranged in tabular form. It was noted that the treatment of concentrated salts having high osmotic pressure was beyond the capability of the hollow nylon fibers. (Galwardi-Texas) W72-12986

W72-12797

W72-12799

THE BIO-FOULING MENACE IN COOLING

SYSTEMS,
A. Mennie, and E. Tehle.
Effluent and Water Treatment Journal, Vol 9, No.
9, p 493-499, September 1969, 4 fig.

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Descriptors: *Cooling water, *Biomass, *Slime, Algae, Fungi, Bacteria, Bactericides, Chlorine, Costs, *Waste water treatment. Iddentifiers: Biocides, Production loss, Quaternary ammonium compounds, Phenolic compounds, Organo-metallic compounds, Amines, England.

The development of biological growths in industrial cooling systems has produced difficult and serious problems, and steps must be taken to control or eliminate biofouling. Excessive growth and development of algae, fungi and bacteria have resulted in biological fouling in cooling water systems. Two case-histories illustrating how biolological fouling can accumulate to shut down essential production processes were presented. One concerning a recirculating cooling system in a pharmaceutical plant where the cost of each shutdown was about 1,000 pounds per hour, and the annual loss of production about 12 hours. Treatment included the use of a synthetic antifoulant which broke up the growth debris, dispersing it into a harmless and easily removed cloud of fine particles. The second case involved a recirculating particles. The second case involved a recirculating cooling system of a chemical by-products complex of a steelworks coke producing plant. The cost of a complete clean-up to restore full operating efficiencies was assessed at 3,000 pounds, of which half was loss of production. Types of biocides used include quarternary ammonium compounds, phenolic compounds, organo-metallic compounds and amines. One common method of inhibiting algal and fungal growth in large cooling systems makes effective use of chlorine as a oxidizing biocide. However, the use of chlorine and related control equipment was shown to be expensive whereas non-oxidizing biocides can be introduced to the largest of systems at much lower cost by direct addition to the cooling tower sump. (Galwardi-Texas) W72-12987

REMOVAL OF CHROMATES FROM PICK-LING LIQUORS BY ADSORPTION OF HYDROUS FERRIC OXIDE, Louvain Univ. (Belgium). Water Pollution Div. D. A. Wilms, F. F. Notebaert, and A. A. Van

Haute.

Preprint, presented at 6th International Water Pollution Research Conference, Session 2, Hall B, Paper No. 4, June 19, 1972, 9 p, 6 fig, 5 ref.

Descriptors: *Adsorption, *Chemical precipita-tion, *Chromium, *Iron oxides, Optimization, Hydrogen ion concentration, Performance, Calcium hydroxide, Sedimentation, Flocculation, Neutralization, *Waste water treatment, Sludge. Identifiers: *Pickling liquors, Praestol 2700, Sludge production.

Experiments on the adsorption of Cr+6 on flocs of Fe (OH)3 showed that adsorption was optimum at a pH=6, at a high Fe+3/Cr+6 ratio, but not higher than 20 and at the highest possible Cr+6 concentration. Depending on the pH and the iron content of the acid effluents, mixing with the alkaline chromate wastewaters would be required until the desired pH=6 was reached, or until the desired Fe+3/Cr+6 ratio was reached, which may require the addition of Ca (OH)2. Optimum separation of the precipitate was found to occur with the use of 0.6 ppm of Praestol 2700 flocculant. The remaining Cr+6 in the supernatant liquid was reduced at Cr+6 in the supernatant liquid was reduced at pH=6 with an adequate amount of FeSO4 and the pH raised to 8 with Ca (OH)2 in order to precipitate the Cr+3 completely. This secondary sludge of Fe (OH)3 + Cr (OH)3 was separated by decantation and could be used for further adsorption of Cr+6 in the first stage of treatment. Such a procedure has the advantage that for the removal

of chromates a minute quantity of neutralizing agent was required and also that there was a minimum production of waste sludge. (Galwardi-W72-12988

DEVELOPMENT OF MINIMUM FLUSH TOILETS/FLUID BED INCINERATION SYSTEMS FOR BARE BASE LATRINE FACILI-TY, Whirlpool Corp., St. Joseph, Mich. Life Support

Dept. W. J. Martin.

Available from the National Technical Informa-tion Service as AD-739 231, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report PREC-TR-71-2, October 1971, 53 p, 17 fig, 1 tab.

Descriptors: *Sewage disposal, *Sewage treat-ment, Water utilization, *Incineration, *Waste water treatment.

Identifiers: *Fluid bed incineration, Water collec-tion, Minimum flush toilets, *Toilets.

The work and results are described in developing a minimum flush toilet and fluid bed incineration system usable with a Bare Base Program Latrine Facility. The configuration evolution of major components is included. Design drawings for a prototype incinerator device suitably sized for the Latrine Facility application and the proposal of a system to integrate this device with the Latrine Facility resulted from the investigation. The minimum flush toilet was shown to operate with only one to two quarts of fresh water per use without requiring chemical additives in the holding tank. (Galwardi-Texas)

PRELIMINARY INVESTIGATIONS ON THE PRECIMINARY INVESTIGATION OF MINING AND INDUSTRIAL WASTE MATERIALS TO FERTILIZATION OF SANDY SOILS: I. IN-FLUENCE OF WASTE MATERIALS ON THE INITIAL GROWTH OF PLANTS UNDER LABORATORY CON DITIONS, (IN POLISH), Wyzsza Szkoła Rolnicza, Lublin (Poland). For primary bibliographic entry see Field 05C. W72-13029

5E. Ultimate Disposal of Wastes

LIQUID-WASTE DISPOSAL AT THE LINFIELD DISPOSAL SITE, DALLAS, TEXAS, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 05B. W72-12414

SEWAGE SLUDGE INCINERATION. Environmental Protection Agency, Washington, For primary bibliographic entry see Field 05D.

COMPATIBILITY OF SUBSURFACE RESER-VOIRS WITH INJECTED LIQUID WASTES, Alabama Univ., University. Natural Resources Center.

For primary bibliographic entry see Field 05B. W72-12656

W72-12631

W72-12796

FINDINGS AND RECOMMENDATIONS ON UN-DERGROUND WASTE DISPOSAL. American Water Works Association, New York. Committee on Underground Waste Disposal and Control. For primary bibliographic entry see Field 05D.

THE INVESTIGATION OF PRECOAT VACUUM FILTRATION AND NATURAL FREEZING AS A MEANS TO DEWATER ALUM SLUDGE, Smith and Mahoney, Albany, N.Y. For primary bibliographic entry see Field 05D.

GROUND-WATER POLLUTION IN MICHIGAN, Michigan State Geological Survey, Lansing. Dept. of Conservation. For primary bibliographic entry see Field 05B.

UNDERGROUND WASTE DISPOSAL Underground Surveys, Inc., Rockford, Ill. For primary bibliographic entry see Field 05D. W72-12802

BASIC DATA FOR CHEMICAL WASTE Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Engineering Dept. For primary bibliographic entry see Field 05G. W72-12803

SUBSURFACE HYDROLOGY AT WASTE DISPOSAL SITES,
IBM Watson Research Center, Yorktown Heights, N.Y. For primary bibliographic entry see Field 05B. W72-12864

THE DISPOSAL OF INTRACTABLE INDUSTRI-AL AND AGRICULTURAL WASTES (CONCLU-

Effluent and Water Treatment Journal, Vol 10, No. 3, March 1970, p 147-149.

Descriptors: *Industrial wastes, *Liquid wastes, *Landfills, *Soil types, Clays, Gravels, Marshes, Land management, Impervious soils, Solid wastes, Waste treatment, Economic feasibility, Waste disposal. Identifiers: Agricultural wastes, England.

The most economical and effective method of disposal of intractable wastes in the foreseeable future will continue to be by land disposal. The contractor should have available at least two sites for waste disposal; one in use and one approved for future use. The types of sites recommen order of preference, were marshland founded on impervious soil, clay pits and dry gravel pits with impervious bottoms which can be effectively sealed at the sides if necessary. Sites which have already been tipped with domestic refuse would be greatly advantageous. If no new sites of the greatly advantageous. If no new sites of the required character can be located, consideration should be given to creating such sites on marshes, saltings or in clay areas. Treatment of wastes will not be generally economic in the immediate future. However, the drying of animal manure slurries to produce a powdered fertilizer and the distillation and incineration of wastes, where an adequate supply of combustible waste oil is available, would be economically feasible. (Galwardi-Texas) W72-12979

5F. Water Treatment and **Quality Alteration**

PROVINCE OF ONTARIO'S PROGRAM FOR FINANCING, CONSTRUCTING AND OPERATING WATER POLLUTION CONTROL AND WATER SUPPLY FACILITIES, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 05D. W72-12480

Group 5F-Water Treatment and Quality Alteration

FLOC STRENGTH AND FILTERABILITY OF

PRETREATED WATER.
Ludwig Engineering and Science Research Foundation, Arcadia, Calif.

Available from the National Technical Informa-tion Service as PB-211 374, 3.00 in paper copy, 0.95 in microfiche. Federal Water Pollution Con-trol Administration, October 1968. 69 p. 29 fig, 5 tab, 16 ref, append. FWDCA Program 17030--10/68, Research Grant WP-00813-02 and 0281.

Descriptors: Water purification, Pre-treatment-Water, Flocculation, Filtration, Filters, Sedimen-tation, Polyelectrolytes, Pilot plants, Suspended soilds, Water treatment, Waste water treatment. Identifiers: Dual media filters.

An experimental study of the interrelationships between filter operation, floc properties, and filter performance was conducted. A laboratory scale pilot plant water clarification unit including rapid mixing, flocculation, sedimentation, and filtration was used for the study. Two different clarification systems were investigated. One system had flocculation and sedimentation ahead of the filters. In the other clarification system, the pretreatment consisted of chemical addition and a brief period consisted of chemical addition and a other period of rapid mixing; thus, in essence, raw water was applied directly to the filters. When operated in this latter manner, the filters were actually serving as contact flocculators. The experimental results show that an effective filtration system is combined of properly matched filter media and floc properties. Weak and non-sticky flocs, for in-stance, are desirable for a fine media filter; whereas, the opposite type of floc are essential for successful operation of a coarse media filter. Also, the study has demonstrated quite adequately the superior performance of a dual media filter bed as compared to that of a single media and filter.

CHARACTERIZATION CHEMICAL SLUDGES, Missouri Univ., Columbia.

For primary bibliographic entry see Field 05D. W72-12798

WATER TREATMENT PLANT WASTE DISPOSAL - ACTION NOW, American Water Works Association Research Foundation, New York. For primary bibliographic entry see Field 05D. W72-12800

CONSIDERATIONS IN LARGE WATER-PLANT DESIGN, Detroit Metro Water Dept., Mich.

E. Cedroni

Journal of the American Water Works Associa-tion, Vol 64, No 5, p 299-303, May, 1972. 1 tab.

Descriptors: *Water treatment, *Treatment facili-ties, *Design criteria, Waste disposal, Recircu-lated water, Drying, Control systems, Cleaning. Identifiers: *Central control panel, Washwater, Clarification, Drying beds.

Design criteria are reviewed for a water treatment plant utilizing a functional central control panel and providing waste disposal. Construction details are given for the submerged timber intake crib. Initial problems and solutions in constructing the intal problems and solutions in constructing the in-take shaft and surveying the raw-water tunnel are described. Details are provided for the low-lift plant, high-lift plant, chemical handling and storage facilities, settling tanks, and filtration plant. Sanitary wastes are disposed in septic tanks. plant. Sanitary wastes are disposed in septic tanks. Filter washwater is recirculated. Sludge from the settling basins is clarified with the supernatant overflow recirculated. The condensed sludge is discharged to drying beds. A central control panel is explained. The only information on the board is that needed by the operator to make decisions within the plant. (Nardozzi-AWWA) W72-12801

RECYCLING RECYCLING AND REUSE OF FILTER BACKWASH WATER CONTAINING ALUM SLUDGE, Hackensack Water Co., Weehawken, N.

For primary bibliographic entry see Field 05D. W72-12805

CRYSTAL-SEED CONDITIONING OF LIME-

-SOFTENING SLUDGE, Auburn Univ., Ala. Dept. of Civil Engineering. For primary bibliographic entry see Field 05D. W72-12806

RAISING AND WATERING A CITY. Loyola Univ. Chicago, Ill. For primary bibliographic entry see Field 05D. W72-12809

THE VORTEX CHAMBER AS A GRIT REMOVAL DEVICE FOR WATER TREAT-

Clemson Univ., S.C. Water Resources Research P. R. Zielinski

P. B. Zielinski. Available from the National Technical Informa-tion Service as PB-211 449, \$3.00 in paper copy, \$0.95 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No 30, 1972. 58 p. 23 fig, 2 tab, 11 ref, 12 append. OWRR A-019-SC (1).

Descriptors: Waste treatment, Storm water, *Water treatment, *Waste water treatment, *Settling basins, Settling velocity.
Identifiers: *Vortex flows, Liquid-solid separators, *Grit chambers.

Efficiency studies on the vortex grit chamber show that the unit is effective in removing grit particles greater in size than ASTM sieve number 60 grit. The grit particles used in these tests ranged in grit. The grit particles used in these tests ranged in size from 16 sieve to 200 sieve, and had a specific gravity of 2.65. The injection rates of dropping the grit into the flow varied from approximately 2 to 25 pounds per minute. Tests with organic materials showed that organic materials such as whole peas and whole kernel corn were completely removed in average flow conditions while only a trace remained in the chamber during the low flow tests. In flows which varied from high rates to low rates and then reversed, there was complete removal of organic material. The flow rates were changed from approximately 0.1 cfs to 1.3 cfs, while the depth of flow varied from 0.3 feet to 2.1 feet for a differing arrangement of the number of inner boundary vanes as well as angle of inclination of the vanes. A theory was developed to predict the location of particle settlement, which can be used for particles ranging in size from number 16 sieve to number 100 sieve. Graphs showing the correlation between the measured position of settlement and the predicted position are given. W72-12946

CHLORINATION - A HISTORICAL SURVEY,

D. F. Brown. Effluent and Water Treatment Journal, Vol 9, No 4, April 1969, p 203-209, 6 fig.

Descriptors: *Chlorination, *History, *Surveys, Public health, Application methods, *Water supply, *Sewage treatment, Power system operations, Industrial wastes, Foods, Swimming pools, Automatic control, *Water treatment.
Identifiers: Gas-chlorinator, Modular system, *United Kingdom.

A historical survey of the development of chlorination was presented. The first practical use of chlorination for the treatment of a public water supply was attributed to Woodhead who employed

a solution of bleaching powder to flush out water mains subsequent to an outbreak of enteric fever in Maidstone in 1897. The development of the gas chlorinator was traced from the first commer-cially-produced gas chlorinator built by Wallace and Tierman in 1913 to the introduction of module chlorination into the United Kingdom in 1969. The module system allowed for complete automatic module system allowed for complete automatic programming, telemetering, quality, quantity and remote control with a savings of up to 40% on the space required by non-modular systems. The use of chlorination outside the water supply industry was also discussed. Applications included: swimming pools, power generation, sewage treatment, industrial effluents and food processing. (Galwardi-Texas) W72-12967

INACTIVATION OF VIRUSES, Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Virology and Immunology.

Descriptors: *Viruses, *Oxidation, *Halogens, Oxidation-reduction potential, Chemical precipitation, Activated sludge, Sea water, Temperature, Waste water treatment, Disinfection, Chlorination, *Water treatment.

Identifiers: Enteroviruses. Adenoviruses. Reoviruses, Inactivation.

The viruses of most specific interest in drinking water supplies include enteroviruses, adenoviruses, reoviruses and the unidentified hepatitis virus. Despite considerable investigation, the actual mechanisms of virus inactivation have not been identified. Studies of viral inactivation by both sea water and activated sludge have not yielded satisfactory results. Chemical inactivation of viruses has been accomplished only by oxida-tion, especially with the halogens. Results from studies on the oxidative inactivation of in-teroviruses and adenoviruses showed that the rate of inactivation was dependent on the oxidation potential according to log K = C, E + C2. (Galwardi-Texas) W72-12968

THE BIO-FOULING MENACE IN COOLING SYSTEMS, For primary bibliographic entry see Field 05D. W72-12987

RURAL WATER-SUPPLY DEVELOPMENT AND THE RECENT APPEARANCE OF EN-DEMIC GOITRE, East African Inst. for Medical Research, Mwanza

For primary bibliographic entry see Field 05C. W72-13032

5G. Water Quality Control

SEWER BEDDING AND INFILTRATION, GULF COAST AREA, Tulane Univ., New Orleans, La.

For primary bibliographic entry see Field 08A. W72-12394

METROPOLITAN DEVELOPMENT -SANITARY SEWERS-POLICIES, PLAN, PROGRAM. SYSTEM Metropolitan Council of the Twin Cities, Minn.

January 1970. 37 p.

Descriptors: *Sewerage, *Sewers, *Cities, *Minnesota, *Comprehensive planning, Design criteria, Sewage treatment, Water quality, Combined sewers, Sanitary engineering, Regional analysis,

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05 Water Quality Control-Group 5G

Urbanization, Regional development, Water policy, Interceptor sewers, Treatment facilities.
Identifiers: *Minneapolis (Minn), *St. Paul (Minn).

This is the first part of a comprehensive guide, developed for the Minneapolis-St. Paul metropolitan area. Part One contains long-range policies as general guidelines for the proper planning, design, and operation of a sewer system in the Metropolitan Area. The purpose is to begin to correct the area's increasing water pollution problems, provide the best long-range uses of rivers and lakes, and guide future development. Part Two contains the system plan for the metropolitan sewer system designed for the year 2,000. It includes descriptions of the general location of interceptors and treatment works and alternative interceptor routes and treatment plant location of interceptors and treatment works and alternative interceptor routes and treatment plant locations that are still under study. Part Three contains the development program and the timetable for the implementation of the sewer plan. It shows which interceptors and treatment plants will be designed and built within the next year (1971). The sewer policies contained in the Developmental Guide are applicable, according to law, throughout the seven-county metropolitan area. (Poertner) W72-12399

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RECOMMENDATIONS ON THERMAL OBJECTIVES FOR WATER QUALITY CONTROL POLICIES ON THE INTERSTATE WATERS OF CALIFORNIA.

California State Dept. of Fish and Games, Sacramento. Water Projects Branch

August 1968. 155 p, 1 fig, 21 tab, 360 ref.

Descriptors: *California, *Interstate rivers, *Water quality standards, *Planning, *Thermal pollution, *Geothermal studies, Thermal stratifiponution, Geometrian studies, Internal stratin-cation, Thermal water, Tidal marshes, Water tem-perature, Oceans, Bays, Estuaries, Rivers, Aquatic habitats, Temperature control. Identifiers: "Temperature requirements.

A guide is provided for the establishment of specific thermal objectives in the water quality control policies. Various policies have previously been adopted by the State Water Resources Board for the interstate and coastal waters of California. The need for thermal objectives is a result of the In eneed for thermal objectives is a result of the increasing development, use and reuse of water. Virtually every major stream and lake in California is subject to additional development which may further change the pattern of both flows and temperatures. The coastal waters may also receive discharges of domestic and industrial waste, or waste cooling water from thermal electric generating plants. These could add heat to the inshore ocean environment. As each new development is ocean environment. As each new development is proposed it will be evaluated on its merits and ef-fect to the environment. In view of studies relating to thermal requirements of aquatic life and historical water temperatures in the interstate streams and lakes of California, temperature limits have been adopted as thermal objectives for water quality control policies. These have been, or will be, adopted for the interstate waters of California. All recommendations contained in the study are to be used in evaluating the probable impact of various proposed projects prior to construction. (Poertner) W72-12403

WATER AND SEWERAGE DEVELOPMENT PLAN. Metropolitan Planning Commission - Kansas City Region, Mo. For primary bibliographic entry see Field 06D. W72-12404

RESOURCE PLAN-WATER RESOURCES McLean County Regional Planning Commission, Bloomington, Ill.

For primary bibliographic entry see Field 06D.

PRELIMINARY GEOLOGIC INVESTIGATIONS
OF ROCK TUNNEL SITES FOR FLOOD AND
POLLUTION CONTROL IN THE GREATER
CHICAGO AREA,
Illinois State Geological Survey, Urbana.
T. C. Buschbach, and G. E. Heim.
Illinois Geological Survey Environmental Geology
Notes, No 52, May 1972. 35 p, 11 fig, 5 tab, 19 ref.

Descriptors: *Geologic investigations, *Underground storage, *Water pollution control, *Flood control, *Illinois, Water storage, Storms, Tunnel construction, Rock mechanics, Underground structure, Geology, Groundwater, Faults (Geologic), Sanitory engineering, Sewers, Outstflow. Overflow. Identifiers: Chicago.

A system of over 100 miles of tunnels in the bedrock of the greater Chicago area has been proposed to intercept overflow from the existing proposed to intercept overflow from the existing combined sanitary-storm water sewer system and to convey it to temporary storage chambers excavated in the rock. Geologic investigations made during a study for the tunnel sites included test drilling and coring, geophysical logging of boreholes, laboratory testing of samples, seismic surveying, and testing for groundwater. The drilling, coring, and logging furnished data that will be of considerable help in mapping and describing the individual units of Silurian and Ordovician strata of the area. The seismic survey individual strata of the area. describing the individual units of Sinina and Ori-dovician strata of the area. The seismic survey in-dicated numerous closed depressions on the sur-face of the bedrock and several faults with dis-placements of 10 to 50 feet on the top of the Galena Group. (Woodard-USGS) W72-12420

HEATED SURFACE JET DISCHARGED INTO A FLOWING AMBIENT STREAM,
National Center for Research and Training in the

National Center for Research and Training in Hydrologic and Hydraulic Aspects of Water Pollution Control, Nashville, Tenn.
For primary bibliographic entry see Field 05B.
W72-12451

SURFACE DISCHARGE OF HEATED WATER. Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab. For primary bibliographic entry see Field 05B. W72-12452

MULTIDIRECTIONAL TURBULENCE PROBE DEVELOPMENT PHASE I - UNIDIRECTIONAL TURBULENCE SENSOR DEVELOPMENT. Battelle Columbus Labs., Ohio. For primary bibliographic entry see Field 02E. W72-12453

A TEST SIMULATION OF THE TEMPERA-TURE OF THE ILLINOIS RIVER AND A PRE-DICTION OF THE EFFECTS OF DRESDEN II AND DRESDEN III REACTORS, Battelle Memorial Inst., Richland, Wash. Pacific For primary bibliographic entry see Field 05B. W72-12454

IN BWR'S, CORROSION CONTROL IS NON-CHEMICAL, General Electric Co., Schenectady, N.Y. For primary bibliographic entry see Field 08G.

ENVIRONMENTAL MATTERS CONCERNING NUCLEAR ELECTRICAL POWER PRODUC-

Office of Environmental Affairs (AEC), Washington, D.C.

J. J. Dinunno, and S. Levine. Nuclear Engineering International, p 607-612, July-August 1970. 2 fig, 2 tab, 13 ref.

Descriptors: *Fuels, *Environment, *Nuclear powerplants, Legislation, Regulation, Radiation, *Thermal pollution, Electric power production,

Currently the use of energy in the U.S. is doubling every 10 years, and population is doubling every 35 years. A brief history of power production is given and it is concluded that alternatives to the use of fossil fuels for energy generation must be found to preserve the earth's limited supply of fossil fuels. Recent environmental legislation on both the federal and the state level is discussed and a few examples of action being taken by states are cited. Proposed amendments to AEC regulations are also discussed. Medical usage of radiation can contribute 45 percent beyond the natural background radiation level, weapons testing contributes 1 percent, and nuclear power and fuel reprocessing plants contribute much less than 1 percent. Because of the long half-lives of kryptom and tritium, their quantity in the environment is inpercent. Because of the long half-lives of krypton and tritium, their quantity in the environment is increasing but they do not concentrate in food chains. The addition of heated water from power-plants results in a thermal modification of the receiving waters, changing chemical and biological processes occurring in them. The annual rate of expenditure for environmental research over the past several years by the US AEC has been approximately 70 million dollars. (Upadhyaya-Vanderbill) W72-12461

HOW TO PLAN A PROGRAM FOR LIQUID EF-FLUENT CONTROL, Calgon Corp., Pittsburgh, Pa. Water Management

H. C. Conger.

Engineering and Mining Journal, Vol 173, No 5, p 77-79, 1972. 2 fig, 1 tab.

Descriptors: "Planning, "Industrial wastes, "Waste water treatment, Effluents, Liquid wastes, Costs, Heavy metals, "Recycling, Identifiers: Waste recycling, Mining industry, Milling industry.

An outline is presented for developing an effective program for mining and milling industries to meet current and anticipated water-effluent control requirements. First the effluent impact on the receiving water must be assessed and a complete waterflow inventory made for the economic evaluation of future action. In defining water quality, sampling should reflect plant operations over a repeatable time cycle with a monthly schedule to detect seasonal changes; complete analyses-especially for heavy metals-should be run over a long period of time. On completion, evaluation can be made and analyses for future work trimmed and confined to known potential work trimmed and confined to known potential problem areas. Combined with water quality standards, a limnological study will provide a more accurate picture of the effects of effluent. This can curate picture of the effects of effluent. This can lead to a more effective control program that may entail lower capital and operating costs than a program based only on water quality data. Information from a survey will enable a company to evaluate and choose the appropriate course of action—to complete or partial recycling or to effluent processing and treatment. Equipment, costs, and treatment processes are tabulated. (Jones-Wisconsin) W72-12475

DISCUSSION OF THE ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT (OECD) AND ITS WATER MANAGEMENT RESEARCH GROUP, Waterloo Univ. (Ontario). Div. of Environmental Studies

For primary bibliographic entry see Field 06B. W72-12477

Group 5G—Water Quality Control

A CASE STUDY: THE NATURE OF THE CON-FLICT EXISTING BETWEEN ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN PUERTO RICO-THE APPROACH AND STRATEGY BEING DEVELOPED, Puerto Rico Dept. of Public Works, San Juan. For primary bibliographic entry see Field 06B. W72-12478

STEREOTYPES OF THE VOLGA STURGEON BEHAVIOUR IN THE REGION OF SARATOV HYDRO-ELECTRIC POWER STATION BE-FORE AND AFTER THE RIVER REGULATION.

Akademiya Nauk SSSR, Yaroslavl. Institut Biologii Vautrennykh Vod. L.K. Malinin, A. G. Poddubnyi, and V. V. Gaiduk. Zool Zh. Vol 50, No 6, p 847-857. 1971. Illus. English summary.

Identifiers: *Fish behavior, *Fish passages, Move-ment, Regulation, Rivers, *Sturgeon, Transmit-

Traces and velocity of sturgeon movements were studied by ultrasonic transmitters. Traces of fish movement in the river and water reservoir were uniform near the river-bed. The relative velocity of fish movement varied within the range. The average velocity was 9.1 m/sec in the river and 20 m/sec in the reservoir. There were 2 peak activities of the fish movement: in the morning and in the evening. On the basis of observations of fish behavior in the dam region, practical recommendations are given for increasing the efficiency of the Saratov fish elevator .-- Copyright 1972, Biological Abstracts, Inc. W72-12509

SLICING UP THE OPEN SPACE: SUBDIVI-SIONS WITHOUT HOMES IN NORTHERN CALIFORNIA, For primary bibliographic entry see Field 04A.

W72-12520

A BILL TO AMEND FEDERAL-AID HIGHWAY ACT (TO REGULATE WASTE DISPOSAL AT SEA), House, Washington, D.C.

H. Boggs.

Congressional Record, Vol. 118, p. S7431-S7432 (daily ed.) May 8, 1972.

Descriptors: *Waste disposal, *Road construc-tion, *Legislation, *Highways, Delaware, Pennsylvania, Delaware River, Highway effectx, Environmental effects, Federal government, Oceans, Navigable waters, Atlantic Ocean, Adop-tion of practices, Sewage, Sludge, Settling basins, Regulation, Oceans, Construction.

Legislation is introduced to amend the Federal-Aid Highway Act by regulating the dumping of highway construction wastes at sea or in the Na-tion's waterways. The bill would require the consent of the Governor of a state potentially affected by the dumping of such wastes in or adjacent to the state's waters before any payment of federal funds for such highway construction work. The need for the legislation has been amply demonstrated in Philadelphia and Delaware where the state of Pennsylvania stands ready to dump 1.8 million cubic yards of sewage sludge in Delaware Bay and the Atlantic Ocean. This could severely damage clam and oyster beds, fishing, and beaches and wetlands. Other possible disposal techniques are discussed. Hearings have been held which indicate severe damage has already occurred from sewage dumping off Delaware. Legislation has already passed the Senate and House to rectify this problem, but the two versions have not been reconciled in conference committee. (Grant-Florida)

REGULATING THE DISPOSAL OF WASTES RESULTING FROM HIGHWAY CONSTRUC-

House, Washington, D.C. For primary bibliographic entry see Field 06E. W72-12583

AMENDMENTS TO THE FEDERAL WATER POLLUTION CONTROL ACT, House, Washington, D.C. For primary bibliographic entry see Field 06E. W72-12584

House, Washington, D.C. For primary bibliographic entry see Field 06E. W72-12586

GREAT LAKES POLLUTION: A FRAMEWORK FOR ACTION.

Queen's Univ., Kingston (Ontario). School of F. J. E. Jordan.

Ottawa Law Review, Vol 5, p 65-83, 1971. 135 ref.

Descriptors: *International joint commission, *Great Lakes, *Water quality control, *Water polution effects, *Canada, Federal government, Water pollution control, Municipal wastes, Industrial wastes, Dredging, Water pollution sources, Eutrophication, Turbidity, Legislation, Political aspects, Administration.

A report submitted by the International Joint Commission (I.J.C.) to the governments of Canada and the United States on the state of water quality in the Lower Great Lakes drainage basin is examined. The chief sources of the pollutants on amined. The chef sources of the polutants of both sides of the boundary are municipalities, in-dustries, watercraft, and dredging activities. The major consequences of the pollution are eutrophi-cation of the lakes, deoxygenation of the waters, algal growth, bacterial and organic contamination, water turbidity, and discoloration, with harmful effects on most legitimate uses of the waters of the Great Lakes. At the jurisdictional level, the I.J.C. concluded that the main problem is the diffusion of authority to take corrective action in the basin. The Commission's recommendations indicate the general and specific goals to achieve and maintain an acceptable quality of water in the basin and suggest how, administratively and politically, the goals may be realized. An agreement between the United States and Canada is recommended. (Waldron-Florida) W72-12589

POLLUTION PREVENTION IN THE ARCTIC-NATIONAL AND MULTINATIONAL AP PROACHES COMPARED,

Ottawa Law Review, Vol 5, p 32-64, 1971. 122 ref,

Descriptors: *International law, *Arctic Ocean, *Water pollution control, *Canada, Water law, Legislation, Oil industry, International waters, Water pollution sources, Oil wastes, Safety factors, Water quality control, Legal aspects, Waste

Identifiers: *Water Quality Improvement Act, Arctic Waters Pollution Act.

This study is primarily concerned with recent legislative efforts of Canada to prevent the future destruction of the Arctic by pollution. Legal issues which arise as the problems of ocean pollution confront the present body of international maritime law are examined. The Canadian Arctic Waters Pollution Prevention Act prohibits the deposit of waste of any kind into the waters of the Canadian Arctic except as authorized by regulation and attempts to prevent the polluting by the

establishment of certain 'Shipping Safety Control Zones', from which vessels are banned unless they comply with various regulations dealing with ship comply with various regulations dealing with ship construction and safety features. It is impossible to evaluate the validity of the Canadian legislation through the traditional approaches of maritime law. It is the inadequacy of old standards that has brought about the need for new principles in this area. The International Convention on Civil Liability for Oil Pollution Damage deals with the nature and liabilities for oil spills. This Convention is compared with both the Canadian legislation and the corresponding United States legislation, the Water Quality Improvement Act. (Waldron-Florida) W72-12590 W72-12590

NEW DIRECTIONS IN WATER QUALITY MANAGEMENT: A PROPOSAL FOR WISCON-

MANAGEMENT C. Wisconsin Senate, Madison.
C. W. Krueger, and M. C. Quinn.
Lincoln Law Review, Vol 6, No 1, p 51-64, 1970.

Descriptors: *Wisconsin, *Water quality control, *Waste treatment, *Water pollution control, Water pollution, Pollution abatement, Municipal wastes, Industrial wastes, Water pollution sources, Water quality, Regulation, Administrasources, water quanty, regulation, Administrative agencies, Treatment facili-ties, Water quality standards, Planning, Water management (Applied), Waste disposal, Costs, Cost sharing, Comprehensive planning.

Many of the procedures used today in water quality control in Wisconsin were developed in the 1920's and 1930's. In recent years the treatment requirements imposed on both municipal and industrial waste contributors have been raised. Industrial polluters have been directed to upgrade their waste removal facilities while municipal sewage utilities have been ordered to provide a minimum of secondary treatment. Despite sub-stantial progress, serious water quality problems still confront Wisconsin. The major alternative to the raising of treatment standards is a system of regional management measures designed achieve specified patterns of water quality. Such a program would include the designation of com-prehensive management areas, development of comprehensive plans, a provision for cost sharing among polluters, and the establishment of area management corporations with broad responsibilimanagement corporations with total responsiona-ties for carrying out the plan. This new approach to water pollution control is needed because exist-ing policies and programs have been only partially successful in reducing pollution of lakes and streams. (Brackins-Florida) W72-12591

TOWARD A STATE REMEDY FOR OIL SPILL DAMAGES: AN INSURANCE APPROACH. New York University Law Review, Vol 47, No 1, p 60-82, 1972. 134 ref.

Descriptors: *Insurance, *Oil pollution, *Oil spills, *Remedies, *Damages, Pollution abatement, Water pollution control, Water law, Legal aspects, Legislation, Water pollution, Regulation, Water pollution sources, Oil industry, Constitutional law, Federal jurisdiction, State jurisdiction, Oceans, Ships, Penalties (Legal), Negligence, Water Quality Act, Foreign trade, Judicial decisions, Maine, Insurance.

Though the costs of an oil spill are sometimes staggering for all parties involved, federal maritime law, which governs oil spills, offers only limited and inadequate remedies. The difficulty of proving negligence and the Limitation of Liability Act seri-ously handicap those parties injured by oil spills attempting to obtain relief through maritime law, except when the government is seeking compensation. Under the 1970 Water Quality Act the federal

government has been provided with an adequate means of recovering its own damages. Most state legislation aimed at oil pollution imposes strict lia-bility for damages. Such legislation presents a challenge to federal admiralty jurisdiction than may not be sustained. Furthermore, the Maine statute imposes a tax on oil terminal operators statute imposes a tax on on terminal operators which may be an unconstitutional tax on foreign commerce. An alternative to state-imposed liability would be to establish a state insurance system to reimburse parties injured by an oil spill. Funding would come from a charge levied against terminal operators. Creation of a limited insurance and restrict and process as the content of the content o minal operators. Creation of a limited insurance-based system may promote a more effective dis-tribution of the social costs of oil transport. In the final analysis, however, only Congress has the authority to create new and equitable solutions for a problem so clearly national in scope. (Brackins-Florida) W72-12592

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FEDERAL COMMON LAW AND INTERSTATE POLLUTION. Harvard Law Review, Vol 85, No 7, p 1439-1459.

Descriptors: *Federal jurisdiction, *Water law, *Judicial decisions, *Water pollution control, Legal aspects, Watercourses (Legal aspects), United States, Federal government, Constitutional law, Legislation, State governments, State jurisdiction, Water pollution, Water rights, Interstate rivers, Interstate, Common law, Regulation Jurisdiction tion, Jurisdiction.

After this note went to press the United States Supreme Court held that federal common law should be exercised in any interstate air or water should be exercised in any interstate air or water pollution nuisance case regardless of the character of the parties. The rationale underlying federal judicial law-making in suits between two states is not applicable to state-nonresident suits. Cases between states and citizens of other states, in contrast to suits between states, are not nearly as likely to be a consequence of differences between the laws of the parties' states. Furthermore the utility of federal common law in this area is not significant in formulating standards to impose on conof federal common law in this area is not significant in formulating standards to impose on conduct affecting the environment for two reasons. First, this task is performed on the federal level by statutory provision and the administrative process. Second, even when such standards are not provided by statute the common law does not provide an adequate alternative context within which to develop such standards. Solutions to our environmental problems must generally be developed by the legislative or administrative process. State law should apply to environmental nuisance cases whether brought in state or federal court. (Brackins-Florida)

THE EFFICACY OF FEDERAL AND STATE CONTROL OF WATER POLLUTION IN INTRA-STATE STREAMS, North Carolina Univ., Chapel Hill. School of Law.

T. J. Schoenbaum. Arizona Law Review, Vol 14, No 1, p 1-38, 1972. 254 ref.

Descriptors: *North Carolina, *Water pollution control, *Interstate rivers, *Federal government, *State governments, Legislation, Legal aspects, Administrative agencies, Water quality control, Water resources development, Federal Water Pollution Control Act, Rivers and Harbors Act, Company of the property of the prop prehensive planning, Alternate planning, Govern-mental interrelations.

Using information gathered from selected streams in the piedmont district of North Carolina, this analysis takes an empirical and case study approach to a critical examination of the operations and effectiveness of the federal and state legal and desired the state of the state administrative processes for water pollution control in intrastate rivers. The major water pollution control laws applicable to the streams under study are examined: the Federal Water Pollution Control Act (FWPCA), which empowers the federal government to proceed directly to abate water pollution and has required states to create and enforce stream standards; the North Carolina Water and Air Resources Act of 1967, which authorizes state officials to set and enforce standards approved by the federal government; the Refuse Act of 1899, which prohibits the discharge of any refuse into the navigable waters of the United States; and the proposed amendments to the FWPCA which seek to strengthen the present federal-state regulatory scheme. Alternative approaches to water pollution control are evaluated, culminating in a recommendation for future action. (Widman-Florida)

REFUSE ACT OF 1899-WILL IT CURB INDUS-TRIAL WASTES. Federal Bar Journal, Vol 30, No 4, p 327-342, 1971.

Descriptors: *Rivers and Harbors Act, *Permits, *Pollution abatement, *Water quality standards, Water law, Legal aspects, Judicial decisions, Legislation, Watercourses (Legal aspects), Water pollution, Water pollution control, Water quality control, Federal Water Pollution Control Act, Water Quality Act, Regulation, Administrative agencies, Administration, State governments, Federal government, Industrial pollution, Sewage effluents, Law enforcement, Waste disposal. Identifiers: *Refuse Act.

In late 1970 a new program to control water pollution from industrial sources through the use of the permit authority in the Refuse Act was announced. This Act outlaws discharges and deposits into navigable waters and tributaries thereof without a permit. Violators of state water quality standards are ineligible for permits. To obtain a permit, the discharger must disclose in detail what amount and what type of effluent he intends to discharge. The permit program is based on the Federal Water Polpermit program is based on the Federal Water Pol-lution Control Act, the Refuse Act, and other Federal Statutes. The Environmental Protection Federal Statutes. The Environmental Protection Agency will resolve all matters relating to the application of water quality standards. The Corps of Engineers will deny an application in accordance with the recommendation of the Environmental Protection Agency. If the State and the Environmental Protection Agency approve the application the District Engineer may deny the permit only if navigation will be hindered or the deposit will have an adverse impact on fish and wildlife resources. The permit program is a drawing together of varian auterse impact on fish and widdlite resources. The permit program is a drawing together of various existing federal laws to form a single, strong system for water quality protection and enforcement. (Brackins-Florida)
W72-12597

PROPOSAL FOR A DEMONSTRATION WATER QUALITY MANAGEMENT PROGRAM ON THE HOLSTON RIVER IN EASTERN TENNESSEE, Cornell Univ., Ithaca, n.y. Water Resources and Marine Sciences Center.

P. L. Wagner.

Technical Report 35, December 1971. 224 p, 1 fig, 2 tab. 270 ref. OWRR C-1196 (No 1963) (2).

Descriptors: *Tennessee, *River basin development, *Water quality control, *Demonstration watersheds, Institutions, Institutional constraints, Political aspects, Water pollution control, State governments, Federal government, Regional analysis, Social aspects, Administrative agencies, Adoption of practices.

Identifiers: *Holston River Basin (Tenn).

A demonstration water quality management pro-gram on the Holston River in Eastern Tennessee is proposed in the belief that regional water quality

management provides an excellent opportunity to organize and implement water pollution control techniques. Objectives of the study include: development of an organizational model for regional plan implementation, development of a strategy for establishing and managing such a program, and employment of the Holston River as a case study. The report analyzes the historical and institutional experiences of the region which must be considered. The technical aspects of the pollution problem and the engineering and administrative techniques available to solve the problem are described. Various institutional options, available governmental alternatives, organizational structure, federal agency arrangements, and the project's relationship with the TVA are discussed. No single agency has the administrative capacity to bring about a full water quality program in the Holston River Basin. It is suggested that the federal government is most capable of bringing about the desired programs for a variety of reasons. (Grant-Florida) W72-12602

SUPREME COURT DECLINES ORIGINAL JU-RISDICTION IN LAKE ERIE POLLUTION CASE, J. W. Wopat.

Miami Law Review, Vol 25, No 4, p 794-799, 1971.

Descriptors: *Ohio, *Federal jurisdiction, *State jurisdiction, *Adjudication procedure, Judicial decisions, State governments, Federal government, Water pollution, Water pollution sources, *Lake Erie.

In Ohio v. Wyandotte Chemicals Corp., 91 S.Ct. 1005, the State of Ohio attempted to invoke the original jurisdiction of the United States Supreme Court to obtain an injunction against three non-resident chemical companies who allegedly created a public nuisance by dumping mercury into Lake Erie. Admitting that original jurisdiction was technically possible the Court declined jurisdiction, arguing that the nature of the case and the historical development of the concept made the Court an unappropriate body for the trial. The court reasoned that: (1) no issue of federal law was presented—only local nuisance principles; (2) a presented—only local nuisance principles; (2) a special master, if appointed, would be ill-equipped to act as a trial court; (3) several competent to act as a trial court; (3) several competent governmental agencies were already involved with the problem; and (4) Ohio state courts presented an alternative forum that could give the relief sought. Now that the Supreme Court has removed itself from this crucial area, the difficulty in computing damages and the possible effect of the instant decision in a state court action, coupled with the ineffectiveness of involved governmental the ineffectiveness of involved governmental agencies, promise little hope for immediate solutions to the problems of Lake Erie. (Dye-Florida) W72-12606

SECTION 169 OF THE INTERNAL REVENUE CODE: AN INCOME TAX SUBSIDY FOR THE CONTROL OF POLLUTION, Northeastern Univ., Boston, Mass. School of

D. Givelber, and D. Schaffer. Arizona Law Review, Vol 14, No 1, p 65-86, 1972.

Descriptors: *Amortization, *Taxes, *Government finance, *Water pollution control, *Grants, Tax rates, Economics, Project feasibility, Water management (Applied), Federal government, Legislation, Non-structural alternatives, Water law, Alternate planning, Pollution abatement.

The Tax Reform Act of 1969 added section 169 to the Internal Revenue Code. This section allows a taxpayer to amortize the cost of a certified pollu-tion control facility over 5 years on a straight line basis, regardless of the actual useful life of the

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facility. Whether section 169 is an efficient and rational means of subsidizing the control of pollution is discussed. A further analysis is made to determine whether a more defensible subsidy could be fashioned to reach more equitable results. The arithmetic of the subsidy is discussed in terms of the amount of the subsidy and the subsidy as a true preference. The scope of section 169 is examined by examining its effect on new plants and the types of expenditures which qualify. Since the section requires that the facilities be constructed or acquired in conformity with a state program or requirements, the question arises as to what this requirement means. Finally, whether the problems of section 169 can be solved by a better tax subsidy or by direct grants is questioned. In light of the present tax structure it would be simpler and easier to subsidize pollution control by direct grants. (Widman-Florida) W72-12608

SAVING THE LAND-WATER EDGE FROM RECREATION, FOR RECREATION, Fordham Univ., Bronx, N.Y. School of Law For primary bibliographic entry see Field 06E.

THE RESTORATION OF A RIVER, For primary bibliographic entry see Field 06E.

SHOWDOWN ON DELAWARE BAY. For primary bibliographic entry see Field 06E. W72-12613

NATURAL RESOURCES DEFENSE COUNCIL V. MORTON (SCOPE OF APPLICATION OF NATIONAL ENVIRONMENTAL POLICY ACT). For primary bibliographic entry see Field 06E. W72-12614

AN ACT ... PROVIDING FOR THE POSTING, AND FORFEITURE...OF A BOND BY ANY VES-SEL IN OR ENTERING UPON THE WATERS OF THE STATE FOR THE PURPOSES OF DISCHARGING OR RECEIVING A CARGO OF ANY BULK OIL IN THE STATE.
For primary bibliographic entry see Field 06E.

AN ACT...FOR THE PRESERVATION AND IM-PROVEMENT OF THE POTOMAC RIVER BASIN.

For primary bibliographic entry see Field 06E. W72-12616

AN ACT...TO AUTHORIZE A WATER POLLU-TION ABATEMENT GRANT PROGRAM. For primary bibliographic entry see Field 06E. W72-12617

AN ACT TO AMEND IC 1971, 13-1-6, CON-CERNING WATER POLLUTION CONTROL. For primary bibliographic entry see Field 06E. W72-12618

UNITED STATES V. GENOA COOPERATIVE CREAMERY CO. (REFUSE ACT SEWAGE EX-CEPTION).

For primary bibliographic entry see Field 06E.

LAND SUBDIVISIONS--MUNICIPAL REGULA-TIONS.
For primary bibliographic entry see Field 06E. W72-12621

ENVIRONMENTAL IMPROVEMENT COMMIS-SION LAW.

For primary bibliographic entry see Field 06E.

COASTAL WETLANDS-PROTECTION. For primary bibliographic entry see Field 06E. W72-12623

SANITARY WATER BOARD V. HARMAR COAL CO. (APPLICATION OF CLEAN STREAMS LAW TO DRAINAGE OF MINES). For primary bibliographic entry see Field 06E. W72-12625

ATLANTIC CITY ELECTRIC COMPANY, B. L. ENGLAND STATION--UNIT NO. 3, BEESLEY'S POINT, CAPE MAY COUNTY, NEW JERSEY, GREAT EGG HARBOR BAY (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 08C.

THE MAIN FACTORS DETERMINING THE ABUNDANCE OF VALUABLE SEMIMIGRATORY FISHES IN THE DON, Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).

nogo Knozyaistva, Rostov-na-Donu (USSR).
A. E. Gorodnichii.
Vopr Ikhtiol. Vol 11, No 3, p 471-478. 1971. Illus.
Identifiers: *Fish populations, Commercial fish,
Abundance, Fishes, Migration, Perches, Pike,
Regulation, *Salinity, Shiners, USSR.

The main semimigratory fishes in the Don region are the pike perch and the golden shiner. Their abundance was primarily determined by the salinity of the Sea of Azov, which is dependent on the river water coming into it. During the past few years, as a result of more complete regulation of the water flow in the Don and other rivers, the salinity of the Sea of Azov has increased. It has been determined that optimal salinity for the growth and reproduction of these fishes is in the 6-10% range. Consequently, in order to control the salinity of the Sea of Azov to enhance the comsaming of the Sea of Azov to entantice the com-mercial catch of the pike perch and the golden shiner it may well be advisable to devise means by which the waters of the Dnieper river or some of the northern rivers would be directed into the sea.--Copyright 1972, Biological Abstracts, Inc. W72-12644

TASTE AND ODOR PROBLEMS WITH THE RIVER RHINE, Karlsruhe Univ. (West Germany). Institut fuer Gastechnik, Feuerungstechnik und Wasserchemie.

W. Koelle, P. Koppe, and H. Sontheimer. Water Treat Exam. Vol 19, No 2, p 120-135. 1970.

Illus.
Identifiers: *Water quality, Activated carbon,
Benzene, Biology, Chloride, Chlorinated
hydrocarbons, Chromatography,
Microorganisms, *Odor, Oxidation, Pollutants,
Rhine River, Sewage, Taste, Temperature.

Using activated carbon for absorption, followed by desorption with CCl4 or benzene, 70-95% of the odorous substances were extracted. Most of the odorous substances were found within the benzene extract; these were further separated by chromatographic methods. The odorous sub-stances remaining after 1 1/2 yr are mainly chlorinated hydrocarbons in low concentrations The biologically readily oxidizable organic sub-stances are decomposed and the synthetic or-ganics may remain. From a microbiological standpoint, this shift from more natural to more synthetic substances may lead to altered environ-mental conditions and may consequently favor those microorganisms which produce taste and

odor. These odorous substances can still be degraded by some microorganisms, but this takes time.--Copyright 1972, Biological Abstracts, Inc. W72-12681

WATER RESOURCES DEVELOPMENT IN THE MULLICA RIVER BASIN, PART I, BIOLOGICAL EVALUATION OF THE MULLICA GREAT BAY ESTUARY, Rutgers - The State Univ., New Brunswick, N. J. Woter Pecuryon Pactor by Text.

Water Resources Research Inst. For primary bibliographic entry see Field 02L. W72-12706

APPLICATION OF ARTIFICIAL RECHARGE TECHNOLOGY FOR MANAGING THE WATER RESOURCES - ANCHORAGE, ALASKA, Alaska Univ., College. Inst of Water Resources. For primary bibliographic entry see Field 04B. W72-12707

PHOSPHATES - A CHALLENGE TO ENVIRON-

MENTAL SCIENCES, Toronto Univ. (Ontario). For primary bibliographic entry see Field 05B. W72-12708

FISH AND FISHERIES IN THE CONTEXT OF ENVIRONMENTAL CONCERN,

Food and Agriculture Organization of the United Nations, Rome (Italy). Dept. of Fisheries. For primary bibliographic entry see Field 05C. W72-12793

BASIC DATA FOR CHEMICAL WASTE DISPOSAL,

Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Engineering Dept. R. W. Haywood, Jr.

Sewage and Industrial Waste, Vol 30, No 9, p 1156-1159, September, 1958. 1 ref.

Descriptors: *Basic data collections, *Chemical wastes, Waste disposal, Toxicity, Waste dilution, Water pollution, Control, Industrial wastes. Identifiers: *Waste characteristics, Product substitution, Process modification.

Benefits derived from early recognition and study of waste disposal problems are discussed. Difficul-ties in obtaining basic data for evaluating disposal requirements are described. No generalization is usually possible for highly variable, complex, organic-inorganic chemical wastes. Control may be achieved through product substitution or process modification. Product substitution examples that lower treatment requirements include: plastic for starch in the textile industry; mineral acid for organic acid; and process applications producing a filterable insoluble salt rather than a highly soluble one. A system's approach should be applied to processes to minimize the cost of production plus waste treatment. Several physical-chemical waste characteristics are enumerated. Testing complicadetailed. Adequacy of testing laboratories must be considered. Toxicological studies should include fish-kill effects and food chain destruction. The size or volume, type (flowing, impounded, tidal), and present and future use of receiving waters are important. For adequate dilution, the shape, quantity, velocity, turbulence, salinity, and thermal stratification of watercourses need study. (Nardozzi-AWWA)

UNDERGROUND WASTE DISPOSAL AND CONTROL

American Water Works Association, New York. Committee on Underground Waste Disposal and

For primary bibliographic entry see Field 05B.

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ROLE OF GROUND WATER CONTAMINA-TION IN WATER MANAGEMENT, Geological Survey, Raleigh, N.C. For primary bibliographic entry see Field 05B. W72-12807

THE RETURN OF A RIVER: THE WIL-LAMETTE RIVER, OREGON, Oregon State Univ., Corvallis. Water Resources Research Inst. G. W. Gleeson. Available from the National Technical Informa-tion Service as PB-211 452, \$3.00 in paper copy, \$0.95 in microfiche. Oregon Water Resources Research Institute Publication WRRI-13, June 1972, 103 p, 24 fig, 10 tab, 83 ref. OWRR A-014-ORE (1).

Descriptors: *River basins, *Water quality control, *Recreation, Standards, Permits, Legislation, *Oregon, Pacific Northwest U.S., *Water quality standards, Pollution abatement. Identifiers: *Willamette River (Ore).

A semi-historical description of the Willamette River is provided for the period 1926 through 1971. River is provided for the period 1926 through 1971. Efforts to effect river improvement are described. Municipalities provided waste treatment facilities for both domestic and permissible industrial wastes. The pulp and paper industry effected reduction in waste discharges to the river. Standards of water quality were established, river flow regulation was adopted for the low flow periods, limitations on water usage beyond minimal quantities were designated at specific control points, and a permit program was developed. The total effort a permit program was developed. The total effort was sustained over a period of more than thirty years. By the most widely accepted standards, the water quality of the Willamette River for more than thirty years was, in the lower reaches and particularly in the Portland harbor, bad. Now, judged by the same standards, the Willamette is once more a river of reasonable quality. W72-12816

PRIMARY CONSIDERATIONS IN REGIONAL WASTEWATER TREATEMENT PLANNING, Mississippi State Univ., State College. Water Resources Research Inst. For primary bibliographic entry see Field 05D. W72-12821

SUBDIVISION PLANNING THROUGH WATER REGULATION IN NEW MEXICO, New Mexico Univ., Albuquerque. Coll. of Law. For primary bibliographic entry see Field 04C.

QUALITY OF WATER FOR IRRIGATION, Agricultural Research Service, Riverside, Calif. Salinity Lab. For primary bibliographic entry see Field 03C. W72-12840

QUALITY OF SURFACE IRRIGATION RUNOFF WATER, Agricultural Research Service, Kimberly, Idaho.

Snake River Research Center. J. A. Bondurant.

American Society of Agricultural Engineers, Transactions, Vol 14, No 6, p 1001-1003, November-December 1971. 1 tab, 7 ref.

Descriptors: *Water quality, *Saline waters, *Fertilizers, *Runoff, *Irrigation water, Infiltration, Cations, Anions, Nitrates, Phosphates, Sodium, Sediments, Surface waters, Idaho, Diffusion, Return flow.

The actual loss of fertilizer from irrigated fields, which may cause contamination of other water supplies, has rarely been determined. This study considers possible mechanisms by which water flowing over or through soil may acquire fertilizer ions and analyzes field studies to determine what, if any, differences exist between irrigation water applied to a field and surface runoff water from that field with respect to common fertilizer elements. The Einstein equation for Brownian movement shows that the diffusion process of soil fertilizer ions to runoff water is not likely to cause an increase in ion concentration in the runoff because the mean velocity of diffusing ions is less than the velocity of soil infiltration. Analysis of applied water and runoff from an irrigation area near Paul, Idaho, indicated that the concentrations of nitrate, phosphate and sodium ions appearing in the runoff were almost the same as those of the applied water. The data emphasized the necessity of taking pooled samples or continuous samples. Improving overall irrigation efficiency would further reduce nutrient and sediment losses and one way to do this is to use irrigation return systems. (Casey-Arizona) W72-12845 (Casey-Arizona) W72-12845

A REVIEW OF CONCEPTUAL MODELS AND PREDICTION EQUATIONS FOR REAERATION IN OPNE-CHANNEL FLOW, Department of the Environment, Ottawa (Ontario). Inland Waters Branch.

Y. L. Lau. Canada Department of the Environment Inland Waters Branch Technical Bulletin No 61, 1972. 28 p, 1 tab, 22 ref.

Descriptors: *Reaeration, *Open channel flow, *Hydraulic models, *Water quality control, *Reviews, Equations, Forecasting, Evaluation, Streams, Dissolved oxygen, Biochemical oxygen demand, Analytical techniques, Self-purification.

Reaeration is a fundamental component of the oxygen balance of a river or stream and consequently knowledge of the phenomenon is vital for correct systems modelling of stream quality. The relationship between hydraulic parameters and the rate of atmospheric reaeration is not established. A pro-gram of the Hydraulic Unit at the Canada Center for Inland Waters to investigate this mechanism has been initiated. A review of the existing knowledge of the process of atmospheric reaeration is given. The conceptual models which have been proposed to explain the mechanism of been proposed to explain the mechanism of reaeration are evaluated. Even though some of these models lead to logical conclusions they can-not as yet be used for the prediction of reaeration rates since they all contain parameters which are very difficult to relate to measurable hydraulic variables. The various empirical and semi-empiric al prediction equations are described. Some areas of research are suggested. (Woodard-USGS) W72-1287.

GROUND WATER IN THE TORTUGUERO AREA, PUERTO RICO AS RELATED TO PROPOSED HARBOR CONSTRUCTION, Geological Survey of Puerto Rico, San Juan. For primary bibliographic entry see Field 04B. W72-12883

GROUND WATER ALONG RIO BUCANO AT PONCE, PUERTO RICO AND THE EFFECTS OF A PROPOSED FLOODWAY ON GROUND-WATER QUALITY,

Geological Survey of Puerto Rico, San Juan. For primary bibliographic entry see Field 04B. W72-12884

RULES AND GUIDELINES FOR THE CONTROL OF WATER POLLUTION FROM LIVESTOCK CONFINEMENT FACILITIES

AND GUIDELINES FOR CONSTRUCTION OF SEALED EVAPORATION AND RETENTION

Colorado Department of Health, Water Pollution Control Commission, Denver, April 10, 1968, 11 p,

Descriptors: *Farm wastes, Feed lots, Confinement pens, *Colorado, Lagoons, Regulation, *Water pollution control.

The Colorado Water Pollution Control Commission established rules for the prevention of water pollution from livestock confinement facilities in the state of Colorado. Guidelines established by the commission are included. Some of them pertain to preliminary considerations, pond surface area, pond storage volume, discharge and percolation, and pond shape, pond fencing and maintenance, land disposal system, embankments and dikes, pond bottom settling tank and biological treatment. (Wallin-lowa State)

WASTEWATER QUALITY CRITERIA, Delaware River Basin Commission, Trenton, N.J.

Preprint, presented at 6th International Water Pol-lution Research Conference, Session 7, Hall A, Paper No. 13, June 21, 1972, p A/7/13/1-A/7/13/8, 19 ref.

Descriptors: Waste water, *Quality control, *Water quality standards, *River regulation, *Polution abatement, Administrative agencies, Water management, Toxicity, Heat, Nutrients, Pestimanagement, Toxicity, Heat, Nutrients,

ides, Viruses.
Identifiers: *Waste water criteria, Allocation concept, Effluent charges.

Waste water criteria, the implementing tools for the water management program of regulatory agencies have been based upon dilution, stream assimilation capacity, allocations, discharge of only negligible quantities, treatment technology, only negligible quantities, treatment technology, waste guides, economic criteria, and anti-degradation. However, in addition to the common criteria, exotics such as toxicity, radioactivity, heat, nutrients, pesticides, and viruses will receive emphasis in the next few decades. The allocation concept will be expanded to encompass a myriad of substances and attempts at economic controls by effluent charges will be utilized. Current wastewater criteria must nevertheless be considered only an interim step as future restrictions will ultiwater criteria must nevertheless be considered only an interim step as future restrictions will ultimately lead to virtual prohibition of controllable, polluting discharges. In order to achieve the desired clean streams from wastewater criteria, administrative mechanisms adequately endowed with authority and responsibility will be required. (Galwardi-Texas)
W72-12976

SEWAGE DISPOSAL IN REFORMED LOCAL GOVERNMENT, J. H. Pawley. Effluent and Water Treatment Journal, Vol 9, No. 7, July 1969, p 399-403.

Descriptors: *Sewage disposal, *Sewage districts, *River basin commissions, *Regulation, Waste water treatment, Population, Size, *Waste disposal.

dentifiers: Government reform, Authority, River basin management, England, Royal Commission, Centralized sewage treatment.

The Royal Commission recommended that England should be divided into 61 new local government areas grouped in eight provinces. The main drainage and sewage disposal service would, therefore, be administered by 61 main authorities, the areas of which would range between 2,227 sq. miles and 93 sq. miles, with populations ranging

Group 5G-Water Quality Control

between 3,232,000 and 195,000. However, the estion arose as to how river authorities were to fit into the consultative pattern and who was to decide priorities. The areas of river authorities would straddle more than one province and river basin management could place obligations on authorities in one province for the benefit of an adjoining province. Moreover, it was pointed out that capital improvement schemes should not be allowed to lie dormant during periods of transition from the old to the new reformed government structure. The Mersey and Weaver River Authority have pro-vided a basis for positive action within their area pending local government reform. They defined 11 districts in which the principles of centralizing the treatment of sewage could be applied and all would be wholly within the area of a new main authority. (Galwardi-Texas)

AGRICULTURAL WASTES AND ENVIRON-

MENTAL POLLUTION, Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05C.

06. WATER RESOURCES PLANNING

6B. Evaluation Process

GOALS, POLICIES AND MANAGEMENT OF WATER RESOURCES IN THE RIO GRANDE Herkenhoff (Gordon) and Associates, Albuquerque, N. Mex. For primary bibliographic entry see Field 04B. W72-12398

PEACE VALLEY AQUATIC RECREATION AREA, RECREATION DEVELOPMENT PLAN, California State Dept. of Water Resources, Sacramento.

A. G. Thrapp, and V. Rosen.

Available from State of Calif, Documents Section, P.O. Box 20191, Sacramento, 95820 Price \$1.00. California Department of Water Resources Bulletin No 117-15, January 1972. 10 p, 1 fig, 2 tab.

Descriptors: *Water resources development, *Recreation facilities, *California, Planning, Projections, Costs, Swimming, Camp sites, Boating, Fishing, Lakes.

Identifiers: Los Angeles County (Calif), *Aquatic recreation area.

A plan is presented for recreation facilities adiacent to the California Aqueduct at Peace Valley in the northwestern corner of Los Angeles County. Recreation facilities on this 346-acre site will provide for picnicking, camping, sightseeing, fishing, horseback riding, hiking and swimming by the cooperative efforts of the State and private enterprise. Facilities are estimated to cost \$4.7 million and would serve 410,000 recreation days annually (2020) (Woodard-USGS) W72-12429

EFFECTS OF INVESTMENTS IN WATER RESOURCES ON REGIONAL INCOME AND EMPLOYMENT.

South Dakota State Univ., Brookings. Dept. of J. E. Wiebe.

In: Proceedings of the Symposium on Symposium on Social and Economic Aspects of Water Resources Development, June 21-23, 1971, Ithaca, New York. American Water Resources Association, Urbana, Illinois, 1972.

Descriptors: *Water resources development, *Economic effects, *Employment, *Income, Regional analysis, Unemployment, Tennessee Valley Authority, Investment, Regression analysis. Identifiers: *Economically depressed regions, Tennessee River.

The effectiveness of water resources investment projects in alleviating regionally depressed economic conditions is evaluated. The region examined was the Tennessee River Watershed, which consists of 125 counties in parts of seven states. The statistical models used were multiple regression analysis, standard partial regression coefficients (beta-coefficients), t-test, and discriminant analysis for two groups. The study suggests (1) that residents in counties in close proximity to water resources investment projects en-joyed a greater per capita income in the long run than did residents in counties not near similar projects; (2) that investments in water resources were in the long run associated with increases in employment in counties removed from the site of the investments and decreases in employment in counties near the investments; and (3) that investments were not associated with an increase in the standard of living for people in low income and less educated groups living near investment areas as compared to similar groups living in areas removed from the investment sites. Thus, the major effects of investments in water resources on regional income and employment are regional in nature and not confined to isolated areas. (See also W72-10480) (Settle-Wisconsin)

DISCUSSION OF THE ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOP-MENT (OECD) AND ITS WATER MANAGE-MENT RESEARCH GROUP, Waterloo Univ. (Ontario). Div. of Environmental

G R Francis

In: Proceedings of the Symposium on Social and Economic Aspects of Water Resources Development, June 21-23, 1971, Ithaca, New York. American Water Resources Association, Urbana, Il-linois, 1972. p 193-197, 9 ref.

Descriptors: *Water resources development, Water pollution, *Management, *Industrial wastes, Thermal pollution, Research and develop-ment, *Environmental effects, Governments.

The water Management Research Group (WMRG) of the Organization for Economic Cooperation and Development was formed in 1967 as a 'sector group' concerned with policy problems. As with other sector groups, the WMRG's basic objective was seen originally as the search for improved understanding of how scientific research may be used by governments as effective support for managerial responsibilities, particularly in sectors which require long-term capital investments. In particular, the Group's members were to (1) exchange information among member countries concerning needs and priorities for water manage-ment and research, (2) identify research deficiencies, (3) define specific research problems warranting attention, (4) establish objectives for future studies in water, and (5) carry out cooperative research projects relating to water management. The problems considered by the Group include eutrophication, detergents, micropollutants, water usage in the iron and steel industry, thermal pollu-tion, pulp and paper industry pollution, and river management. Due to recent changes of emphasis in the OECD, the Group's work in the future will have to be of a wide multi-disciplinary nature, and its focus will have to be on the relationship of environmental questions to economic and social policies. (See also W72-10480) (Settle-W72-12477

A CASE STUDY: THE NATURE OF THE CON-FLICT EXISTING BETWEEN ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN PUERTO RICO--THE APPROACH AND STRATEGY BEING DEVELOPED, Puerto Rico Dept. of Public Works, San Juan. A. Santiago-Vasquez.

In: Proceedings of the Symposium on Social and Economic Aspects of Water Resources Development, June 21-23, 1971, Ithaca, New York. American Water Resources Association, Urbana, Illinois, 1972. p 227-228.

Descriptors: *Economics, *Conservation, *Environmental effects, Agriculture, Planning, Management, Puerto Rico.

Identifiers: *Economic development, *Externali-

Faced with a per capita 1970 income of only \$1,426 and unemployment rates varying between 10 and and unemployment rates arrang between 10 and 12 percent, Puerto Rico cannot afford to slow down its economic growth without endangering the welfare of its people. Yet, Puerto Rico is also faced with the problem of halting environmental deterioration. Over the past 30 years some of the best agricultural land has been converted to other uses. Hundreds of acres of foothills have been leveled for housing development, thus creating such problems as loss of topsoil, erosion, and heavy sedimentation. The coastal sand beaches and estuarine areas have suffered tremendously because of the removal of sand for concrete production. The potential production of hydroelectric power has decreased significantly as a result of increased watershed sedimentation. Flooding and a lack of adequate conservation programs have drastically reduced the island's flora and fauna. To help solve these environmental problems the Commonwealth government is pursuing several approaches: (1) a technical and professional group was created to monitor environmental trends and make policy recommendations; (2) environmental considerations are being explicitly included in the planning process; and (3) several specific environmental conservation programs are being promoted. (See also W72-10480) (Settle-Wisconsin)

A PLANNING, PROGRAMMING AND BUDGETING APPROACH TO GOVERNMENTAL COORDINATION OF NATURAL RESOURCE PROGRAMS FOR PRINCE ED-WARD ISLAND,

Waterloo Lutheran Univ. (Ontario). Dept. of F. Millerd.

In: Proceedings of the Symposium on Social and Economic Aspects of Water Resources Development, June 21-23, 1971, Ithaca, New York, American Water Resources Association, Urbana, Il-linois, 1972, p 233-236.

Descriptors: *Planning, *Budgeting, *Natural resources, Economic impact, Economic efficiency, Unemployment.
Identifiers: *Programming, Resource development, *Prince Edward Island.

A comprehensive fifteen-year development plan has been undertaken for Prince Edward Islan the federal and provincial governments. The basic strategy of the plan is 'to restore flexibility and capability both in the economy and institutions of the province. Projects within the plan are directed toward encouraging the development of viable export sectors and thus stimulating secondary and tertiary activities. The agricultural program is aimed at increasing net agricultural income with a smaller number of full-time commercial farmers. The tourist and recreation projects are aimed at increasing the number of visitors to the island, and increasing their length of stay and expenditures. Under the forestry program, all forest land will be developed and managed so as to encourage the

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island's natural environment. The fisheries development program will endeavor to increase the average incomes of fishermen. In addition to these natural resources development programs, other programs are devoted to improvements in the island's social infrastructure and educational the island's social infrastructure and educational facilities. The use of the planning, programming, and budgeting system (PPBS) by program managers should insure (1) that all projects are at least designed to fulfill plan objectives, and (2) that alternatives are properly evaluated. The advantages and disadvantages of PPBS are outlined. (See also W72-10480) (Settle-Wisconsin) W72-12479

PROVINCE OF ONTARIO'S PROGRAM FOR FINANCING, CONSTRUCTING AND OPERATING WATER POLLUTION CONTROL AND WATER SUPPLY FACILITIES, Cornell Univ., Ithaca, N.Y. For primary bibliographic entry see Field 05D.

SOIL SCIENCE IN RELATION TO WATER RESOURCES DEVELOPMENT: V. ECONOMIC EVALUATION OF WATER RESOURCES DATA, Iowa State Univ., Ames.

J. E. Timmons. Soil Science Society of America Proceedings, Vol 36, No 1, p 187-194, Jan-Feb 1972. 2 fig, 49 ref.

Descriptors: *Water resources development, *Evaluation, *Water allocation (Policy), Water utilization, Economics, Flood control, Decision making, Domestic water, Planning, Soil Science, Water quality, Multiple use, Bibliographies. Identifiers: *Water appraisal needs.

Increasing demands for water, coupled with quality deterioration of existing water supplies, require important decisions on the future use, allocation, and development of water resources. In making these decisions, public and private entities urgently need information to determine alternative courses of action. Decisions concerning water use and development are based on political, economic, and physical considerations. These decisions can be no better than the physical data on whoch analyses are performed and from which choices are made. Three steps are pursued in developing guidelines for use by soil scientists in planning water resource studies: (1) examination of mutual objectives and interrelationships between soil water resource studies: (1) examination of mutual objectives and interrelationships between soil science and economics research for water use decisionmaking; (2) discussion of water use decisions as related to data needs; and (3) suggested guidelines for planning soil science research for water resources decisionmaking. (USBR) W72-12658

FORMULATION OF TECHNIQUES TO PRE-DICT THE IMPACT OF MAJOR WATER RESOURCE CONSTRUCTION PROJECTS ON LOCAL GOVERNMENT FINANCES,

LOCAL GOVERNMENT FINANCES, Montana State Univ., Bozeman. Water Resources Research Center. John H. Wicks, and Alan H. Taylor. Available from the National Technical Informa-tion Service as PB-211 562, 53.00 in paper copy, 80.95 in microfiche. Completion Report No. 27, (1972), 20 p, 7 tab, 6 ref. OWRR A-054-MONT (1).

Descriptors: *Evaluation, *Economic impact, *Economic prediction, *Government finance, *Community development, *Montana, Construction, Costs, Local governments, Water resources development.

The study attempted to estimate predictors of the impact of major water resource construction projects on expenditures and on tax bases of local governments. Step-wise regression of five year changes (1957-62) in expenditures for various

functions in 56 Montana counties obtained from Census of Government data on variables which a priori economic reasoning would suggest as pre-dictors yielded mostly statistically significant results. The equations did not provide reliable esti-mates of changes which occurred over the subresults. The equations did not provide reliable estimates of changes which occurred over the subsequent five years. Regression of expenditure changes on construction employment during four dam construction projects in Montana produced insignificant results. Interviews with local officials indicated the projects had not caused extraordinary financial problems. An apparent reason for lack of expenditure response to construction activity is severe statutory limitations on local government finances. Cross-section regression of various expenditures on population for Montana counties provided significant estimates of long run adjustment of local expenditures to population differences. Assuming that past long run expenditure adjustments indicate expenditure needs when there are population increases—the primary result of construction activity—the coefficients estimate per capita needs from construction impact. These estimates included general control \$9.57, sewage \$7.32, fire protection \$7.59, police \$7.62, health \$9.39, welfare \$5.60, highways \$21.53, and education \$151.90. (Hulse-Montana) W72-12818

OBJECTIVES AND RESULTS OF THE DEVELOPMENT POLICY IN NORTH-EAST

DEVELOPMENT POLICY IN NORTH-EAST BRAZIL, Nijmegen Univ. (Netherlands). Geographical and Physical Planning Inst. J. M. G. Kleinpenning. Tijdschrift voor Economische en Sociale Geografie, Vol 62, No 5, p 271-284, September-October, 1971. 1 fig, 20 ref.

Descriptors: *Regional analysis, *Semiarid climates, *Water resources development, *Human population, *Foreign lands, Hydroelectric power, Water supply, Sewerage, Federal government, Mapping, Industrial production, Social aspects, Political aspects, Economic feasibility, Geographical services.

cal regions.
Identifiers: *Northeast Brazil, *Developing nations, *Population problems.

The semiarid Northeast, with about 18% of the total land area of Brazil and about 29% of the total population, is the most densely populated problem area of the country. The government has gradually developed a sense of response to the plight of the North-east beginning with small amounts of drought aid in the 1800's to the organization of the 'Superintendencia de Desenvolvimento do Nordeste' (SUDENE) in 1959. The goal of this organization is to advance the socioeconomic level of the North-east by moving on a broad front ganization is to advance the socioeconomic level of the North-east by moving on a broad front against the regions problems. The infrastructure of roads, electric power, and public health, involving water supply extension and sewage system installation, have been significant improvements. Mapping activities have been extended and upgraded to include mineral deposits, hydrogeology and fisheries. Efforts to increase the appreciation and initiation of irrigated agriculture have been made, but resisted by a conservative rural population. The industrialization program is discussed in some detail. If it is not possible to develop and further extend in the 1970's those projects begun in the 1960's, the future will be grim. Perhaps most important of all is the need for an effective regional birth control program, but the prognosis for its success is not good. (Casey-Arizona)

THE SPATIAL BEHAVIOR OF CAMPING AMERICA: OBSERVATIONS FROM THE ARIZONA STRIP, Arizona Univ.. Tucson. Dept. of Geography and Area Development.
L. J. Gibson, and R. W. Reeves.
Rocky Mountain Social Science Journal, Vol 9, No 2, p 19-30, April 1972. 4 fig, 2 tab, 3 ref.

Descriptors: *Water utilization, *Social needs, *Recreation demand, *Arizona, *Camp sites, Social aspects, Geographical regions, Model studies, Regression analysis, Surveys.

Identifiers: *Environmental perception.

Identifiers: *Environmental perception.

An effort was made to find out what kind of people campers are, and what the nature of their movements through space is. Questionnaire-based interviews were conducted with 298 camping parties in June 1970, in the 6 organized and regularly maintained campgrounds located near the major highways of the Arizona Strip, the relatively isolated section of Arizona north of the Colorado River. The campersswere, by and large, a cross-section of middle class America. The typical party included a white, middle-aged husband and his wife and 1-3 children. Affluence and education were somewhat above the national norms. All regions of the U.S. were represented, except for the strip itself, but about 1/2 of the parties originated in southwestern states. About 60% planned to spend 2 nights or less in the strip and only 16% thought of it as their primary destination. The 6 campgrounds performed somewhat different functions. Those with water-based outdoor recreation were much more often primary destinations and supported longer stays. Using a multiple regression constant and coefficients, a partially successful model was devised. (Casey-Arizona) W72-12847

URBAN WATER PLANNING--A BIBLIOG-

RAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information

Available from NTIS, Springfield, Va. 22151, as PB-211 553, \$6.00 paper copy; 0.95 microfiche. Water Resources Scientific Information Center Report WRSIC72-215, July 1972. G. F. Mangan and H. A. Swenson, Editors. 373 p. 249 ref.

Descriptors: *Bibliographics, *Abstracts, *Urban hydrology, *City planning, *Information retrieval, Publications, Documentation, Indexing, Classification, Information exchange, *Planning, *Municipal water, *Water supply.

Identifiers: *Urban water planning.

This bibliography is one in a series produced wholly from the information base in Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 41,521 abstracts covering SWRA through May 15, 1972 (Volume 5, Number 10). The significant 1972 (Volume 5, Number 10). The significant descriptor index is made up of a fraction of the total descriptors and identifiers by which each paper has been indexed. It represents weighted terms that best describe the information content; this status is indicated by the asterisks which precede them. The comprehensive index represents all of the descriptors and identifiers by which each paper has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Abstracts with full bibliographic details are listed in ascending Accession Number Order. In the author index, each author is keyed to the page instead of to the accession number. (Woodard-USGS)
W72-12921 W72-12921

WATER CENTER ORGANIZATION AND MANAGEMENT, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. G. L. Anderson, J. C. Frey, S. O. Ikenberry, and W. M. Swope. Available from the National Technical Information Service as PB-211 459, \$6.00 in paper copy, \$0.95 in microfiche. Research Publication Number 72, February 1972, 420 p, 10 fig, 135 tab, 6 append. OWRR C-2109 (No 3364) (1).

Field 06—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

Descriptors: *Water Resources Research Act, *Allotments, *Professional personnel, Publications, *Research facilities, *Personnel management, Colleges, *Universities, *Organizations, *Water Resources Institute, Coordination, *Management, Planning. Identifiers: *Public Law 88-379.

Management and organizational characteristics of the 51 water centers established under the Water Resources Act of 1964 are presented. Areas discussed included the level and sources of funding, interuniversity organizational arrangements, personnel characteristics, areas of research, training emphasis, research accomplishments, and attitudes held toward the water center by administrative personnel. A statistical analysis is made of the relationship between organizational and management characteristics and accomplishments e water centers. With some exceptions it was found that the organizational arrangements seemed to have little influence on the level of accomplishment. Significant relationships were found betweand responds to it in proportion to its concentration. Creeks draining developed land carried twice the nitrogen as those draining relatively undisturbed watershed. Human activity doubles nitrogen inflow to the lake. Exporting all sewage would remove 70% of the nitrogen. (Jones-W72-12954

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EFFECTS OF INVESTMENTS IN WATER RESOURCES ON REGIONAL INCOME AND EMPLOYMENT, South Dakota State Univ., Brookings. Dept. of

Economics.

For primary bibliographic entry see Field 06B. W72-12476

PROVINCE OF ONTARIO'S PROGRAM FOR FINANCING, CONSTRUCTING AND OPERATING WATER POLLUTION CONTROL AND WATER SUPPLY FACILITIES, Cornell Univ., Ithaca, N.Y.

For primary bibliographic entry see Field 05D. W72-12480

FORMULATION OF TECHNIQUES TO PRE-DICT THE IMPACT OF MAJOR WATER RESOURCE CONSTRUCTION PROJECTS ON LOCAL GOVERNMENT FINANCES, Montana State Univ., Bozeman. Water Resources

For primary bibliographic entry see Field 06B. W72-12818

6D. Water Demand

AKES OF WEST VIRGINIA, West Virginia Dept. of Natural Resources, Char-leston. Div. of Water Resources. M. S. Baloch. 1972. 82 P, 5 FIG, 8 TAB.

Descriptors: *Impoundments, *Lakes, *Im-Justin James Justin Jus

This is an initial attempt by the West Virginia Division of Water Resources to publish an inventory of all lakes in the State of West Virginia. The data sought included the name of the lake, of the stream on which it is located, drainage area above dams, date of completion of the lake, maximum storage capacity in acre feet, uses of the lake, height of dam, name of owner, and the county in which the dam structure is located. Except for water ponded naturally in a few glades and in plugged limestone sinkholes, all of the natural surface storage of water in West Virginia is limited to the channels of streams and their flood plains. At present, dammed lakes and reservoirs constitute the most important means of storing surface water in West Virginia. Most reservoirs serve multi-pur-pose uses such as flood control, navigation, water supply, and hydroelectric power generation. These reservoirs vary from small privately owned ponds to giant state and federal facilities. (Poertner) W72-12307

WATER AND SEWERAGE DEVELOPMENT

Metropolitan Planning Commission - Kansas City Region, Mo.

April 1971, 130 p. 19 fig. 26 tab. 16 ref.

Descriptors: *Missouri, *Kansas, *Sewerage, *Water supply, *Regional analysis, Regional development, Planning, Financing, Water supply development, Water treatment, Geology, Urbanization, Drainage, Climates, Topography, Sewers, Soils, Water demand.

Identifiers: *Kansas City.

Regional goals were considered. The 'water' goal is to obtain a comprehensive water system for the region that will provide adequate supply with desirable quality standards. The 'sewerage' goal is basically to obtain and maintain efficient sewerage systems. Each county is discussed individually, keeping in mind that the proposed facilities development should be coordinated with land use development for a workable regional program. Studies of the economic condition of the planning area and the projections for population growth and distribution of that growth were made. Studies and analyses were made of water consumption and fu-ture water demands, along with the capacity and ability of existing water facilities to meet and adequately serve these future demands. Emphasis was placed on the theory that water supply and treatment is best served with consolidation of facilities into fewer, more efficient systems serving larger areas. By establishing ultimate goals, much wasted effort and duplication of efforts will be eliminated. It is suggested that a list of priorities be drawn up for each county and that frequent up-dating be carried out to keep abreast of future developments. (Poertner) W72-12404

NATURAL RESOURCE PLAN-WATER

RESOURCES.
McLean County Regional Planning Commission, Bloomington, Ill.

March 1972. 126 p, 3 fig, 17 tab, 10 ref.

Descriptors: *Water conservation, *Water pollution control, *Water supply, *Flood control, *Il-linois, Septic tanks, Sewerage, Flood plains, Flood protection, Water requirements, Planning, Urbanization, Regional analysis, Flood plain zoning, Land use, Long-term planning, Urban drainage, Storm runoff.
Identifiers: *McLean County (III).

Three aspects of water resource conservation and development are considered. These include flood control, water supply, and water quality and pollution as they relate to McLean County, Illinois. Additional and updated inventory information is presented, and goals and recommendations are made to guide future decisions that will be made regarding water resource conservation and development. It is affirmed that through proper zoning of flood plain areas damage to develop-ments will be minimized. There is enough land in the county for further growth and development

without using flood plain land. A long range program is recommended, preferably for a future gram is recommended, preferably for a future period of 50 years or more. A cooperative program throughout the area is recommended to preclude the proliferation of undesirable land-use patterns and duplication of development efforts. Septic tanks would be permitted only if they meet adopted standards. Further study is suggested to determine the types of treatment needed for various water uses in the area. A permanent management was the standards. ous water uses in the area. A permanent manage-ment organization is recommended to oversee the entire system with assistance provided by the McLean County Health Department. (Poertner) W72-12405

A PLAN FOR WATER AND SEWER.

Chatham County-Savannah Metropolitan Planning Commission, Savannah, Ga.

June 1971. 94 p, 28 fig, 11 tab.

Descriptors: *Water supply development, *Sewerage, *Financing, *Comprehensive planning, *Water resources development, Georgia, Water policy, Water districts, Water pollution control, Industrial wastes, Regional analysis, Construction coats, Waste water treatment.

Identifiers: *Chatham County (Georgia), *Savanath (Georgia) nah (Georgia).

An updated version is presented of three previous planning documents: (1) 'A Plan for Water and Sewer' (Ga. P.56) published in October, 1968; (2) Water and Sewer Financial Plan' (Ga. P-128) published in December, 1969; and (3) 'Water and Sewerage Improvements Needed in 1975 in Chatham County' (Ga. P-128) published in March, 1970. The 'Plan for Water and Sewer' outlines a program of pollution abatement and water service extension to presently populated areas and addi-tional areas where population is projected by 1985. The 'Water and Sewer Financial Plan' recommends methods of financing needed improvements over a long term, and suggested organizaments over a long term, and suggested organiza-tional structures which could implement the pollu-tion abatement program. The 'Water and Sewerage Improvements needed in 1975 in Chatham County' presents estimates of cost and facilities that would be required in the five year period 1976 1973. This play being a combination period 1970-1975. This plan, being a combination of the three previous plans, is a generalized com-prehensive guide which identifies and evaluates the physical aspects of existing and future water and sewer systems in the Savannah/Chatham County Metropolitan Area. The plan also projects the capital requirements for 6 years and recom-mends a means of financing the needed improvements. Other recommendations included in this re-port relate to cessation of discharging any partially treated or untreated sanitary waste into the recreational or other classified streams and the upgrading of existing treatment facilities to meet pollution abatement standards. (Poertner) W72-12406

COUNTY OF SANTA BARBARA WATER AND SEWERAGE FACILITIES PLAN. Boyle Engineering, Ventura, Calif.

Santa Barbara County-Cities Area Planning Council, Santa Barbara, California, June 1971. 220 p, 8

Descriptors: *Water supply, *Cities, *Comprehensive planning, *Sewerage, *California, Financing feasibility, Water requirements, Water demand, Sewage district, Regional analysis, Planning, Urbanization, Water quality, Administration, Waste water treatment.

Identifiers: *Santa Barbara County (Calif), Waste water management.

This plan represents a functional element of the General Plan for the County of Santa Barbara. The study area is limited to the South Coastal and

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Santa Ynez sections of the County. Planning efforts were directed toward providing practical long-range solutions to the future needs for water, and the collection and disposal of sewage. The resultant comprehensive plan answers questions concerning: facilities that are required, when the facilities will be needed, how much they will cost, and what political jurisdiction is necessary. Information is presented in a manner to establish guidelines for future development of physical facilities. As a result of its attractive environment, the county will continue to grow. Because of the expected growth, it is estimated that water needs will increase by more than 50 percent. These needs will be met by importation of water from the State Water Project. Improvement of water quality by will be met by importation of water from the State Water Project. Improvement of water quality by treatment will insure protection of public health. The type and degree of treatment required depends upon the quality of raw water available. The proposed plan overcomes the shortcomings that previously have plagued sewage disposal goals by proposing consolidation of facilities of various communities where possible to reduce costs and charges. Separate jurisdictional districts are called for to provide for regional planning. It is estimated that the cost to implement the Plan to meet needs to the year 2000 is 33.8 million dollars, not including improvements of a local nature nor construction proposed by the Goleta County Water District. (Poertner)

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PREDICTIONS OF AGRICULTURAL IRRIGA-TION FOR INDIANA AND IRRIGATION POTENTIALS OF SELECTED INDIANA SOIL

SERIES, Indiana State Dept. of Natural Resources, Indi-For primary bibliographic entry see Field 03F. W72-12524

HYDROLOGIC BUDGET OF THE POUDRE

VALLEY, Colorado State Univ., Fort Collins. Dept. of Civil For primary bibliographic entry see Field 02A.

6E. Water Law and Institutions

DISCUSSION OF THE ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT (OECD) AND ITS WATER MANAGEMENT RESEARCH GROUP, Waterloo Univ. (Ontario). Div. of Environmental

For primary bibliographic entry see Field 06B. W72-12477

A PLANNING, PROGRAMMING AND BUDGETING APPROACH TO GOVERNMEN-TAL COORDINATION OF NATURAL RESOURCE PROGRAMS FOR PRINCE ED-

Waterloo Lutheran Univ. (Ontario). Dept. of For primary bibliographic entry see Field 06B.

THE LOCAL INSTITUTION FOR GROUND-WATER BASIN MANAGEMENT—A REPORT TO THE NATIONAL WATER COMMISSION, High Plains Underground Water Conservation District No. 1, Lubbock, Tex. For primary bibliographic entry see Field 04B. W72-12502

VOTERS APPROVE AMENDMENT 4.

The Cross Section, Vol 17, No 5, p 1, May 1971. 1 tab, 1 fig.

Descriptors: "Water law, "Legal aspects, "Constitutional law, "Appropriation, Water quality, Water resources development, "Texas, Bonding, Budgeting, Federal Budget. Identifiers: Clean water Amendment, Texas Water Development Fund.

A constitutional Amendment was passed by the Texas voters on May 18, 1971, known as Amendment 4 or the Clean Water Amendment. The Amendment carried about 53 percent of the votes, 403,532 votes for and 356,473 votes against. An additional 100 million dollars worth of Texas Water Development Fund Bonds are authorized with a 6% ceiling. The 1982 termination date for the fund is repealed. Appropriated bonds will be used exclusively for water quality enhancement through matching federal funds. Voters in West Texas showed a poor turnout. Defeated Amendment 2 would have authorized 3 1/2 billion dollars in water bonds. It will take favorable votes from East and West Texas to continue progress in development West Texas to continue progress in development of Texas water. (Popkin-Arizona) W72-12513

WATER CODE FOR TEXAS.

The Cross Section, Vol 17, No 5, p 2, May 1971.

Descriptors: *Water law, *Legal aspects, *Legislation, *Texas, *Water resources development, Water conservation, River regulation. Identifiers: *Texas Water Code.

The new Texas Water Code, House Bill 343 carried by Rep. Bill Clayton of Springlake, is a non-substantive revision of the general and permanent water laws of Texas, effective on August 31, 1971. The 1963 Legislature directed the Texas Legislature competition for the competition of the state of the texas Legislature of t The 1963 Legislature directed the Texas Legisla-tive Council to plan and execute a permanent statutory revision program. The Business and Commerce Code in 1967 was the first revision enacted. The new Water Code, as the second enacted revision, consists of General Provisions, State Water Administration, River Compacts and General Law Districts in 26 chapters. Un-derground water conservation districts are pro-vided in Chapter 52, Title IV, General Law Dis-tricts. The new code makes administration and un-derstanding of Texas' water law much easier and derstanding of Texas' water law much easier and more systematic. No substantive changes were made. Substantive changes were proposed and require approval separate from the new Water Code. (Popkin-Arizona) W72-12514

WELL LOCATION MEASUREMENTS, High Plains Underground Water District No. 1, Lubbock, Tex. For primary bibliographic entry see Field 04B. W72-12516

SURVEY OF WESTERN STATES' UNDERGROUND WATER MANAGEMENT PROVI-

Texas Tech Univ., Lubbock. School of Law.

T. Floyd. The Cross Section, Vol 17, No 7, p 1,3, July 1971. 1 fig, 15 ref.

Descriptors: *Water law, *Legal aspects, *Legislation, *Water management (Applied), *Water resources development, Water control, Governments, Groundwater, Waste water (Pollution), Arizona, California, Colorado, Idaho, Montana, Nebraska, Oklahoma, Oregon, Texas, Utah, Wyoming, Washington.

Statutory provisions of Arizona, California, Colorado, Idaho, Montana, Nebraska, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming were compared with regard to local control exercised over underground water. Six of the twelve states had provisions for local groundwater control, and only three (California, Nebraska and

Texas) gave much power to local agencies. Three states (Colorado, Utah and Wyoming) give only advisory and administrative powers to local agencies. Texas gives the strongest provisions for local groundwater control. Statutes are cited. Waste regulations are reviewed. (Popkin-Arizona) W72-12529

THE COUNCIL OF AN INTERNATIONAL SEA-BED AUTHORITY,
Harvard Univ., Cambridge, Mass.
L. B. Sohn.

San Diego Law Review, Vol. 9, No. 3, p. 404-431, 1972. 45 ref.

Descriptors: "International law, "Alternate planning, "Law of the sea, "International waters, Programs, Canada, United States, Political aspects, United Nations, Comprehensive planning, Adoption of practices, Water resources development, Project feasibility.

development, Project feasibility.

It is generally agreed that the international regime for the exploration and exploitation of the sea-bed will consist of a basic set of rules and of an international machinery for the implementation of these rules. Proposals made so far and the possible ways of reconciling the apparent differences are explored. Current proposals for the sea-bed council include the Tanzanian draft statute, the Latin American working paper, the working paper of land-locked and shelf-locked states, the Soviet Draft treaty and Polish working paper, the United Kingdom proposals, the Canadian working paper, the United States working paper, and private drafts. More comprehensive proposals for an ocean regime include Ambassador Pardo's (Malta) draft, the draft statute of Mrs. Elisabeth Mann Borgese, and the Iraqi proposal. Many other options are possible within the general framework suggested by the Secretariat of the United Nations. The suggestions are merely illustrative of possible solutions and the final decision will be made at the bargaining table. If the proposed international Sea-Bed Authority is to be given important powers and duties, its structure must be satisfactory to the major groups of states. (Widman-Florida) W72-12581

A BILL TO AMEND FEDERAL-AID HIGHWAY ACT (TO REGULATE WASTE DISPOSAL AT SEA), House, Washington, D.C. For primary bibliographic entry see Field 05G. W72-12582

REGULATING THE DISPOSAL OF WASTES RESULTING FROM HIGHWAY CONSTRUC-

House, Washington, D.C. C. W. Sandman. Congressional Record, Vol. 118, E4853-E4854 (daily ed.) May 9, 1972.

Descriptors: *Road construction, *Waste disposal, *Legislation, *Highways, Feens, Vania, Highway effects, Environmental effects, Pederal government, Oceans, Navigable waters, Delaware River, Atlantic Ocean, Adoption of practices, Sewage, Sludge, Settling basins, Regulation, Construction.

Identifiers: *Marine Protection Act.

The need for legislation regulating the dumping of wastes from highway construction into navigable waterbodies and the ocean is discussed. Legisaltion has been proposed that will deny federal funds for transporting and disposing of such wastes as a part of the Federal -Aid Highway Act. The problem of waste dumping is particularly acute in Philadelphia where some 2 million cubic yards of sewage sludge were almost dumped into lower Delaware Bay. This could have caused

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grave harm to Atlantic beaches. The joint House-Senate conference committee on the Marine Protection Act is urged to hasten its efforts to report out the bill since one of its provisions regulates and eventually prohibits ocean dumping. Reprints of several newspaper accounts concerning the Philadelphia sludge dumping incident are contained in the Record. (Grant-Florida)

AMENDMENTS TO THE FEDERAL WATER POLLUTION CONTROL ACT, House, Washington, D.C.

J. D. Dingell.

Congressional Record, Vol. 118, E4883-E4887 (daily ed.) May 9, 1972.

Descriptors: *Legislation, *Federal Water Pollution Control Act, *Abatement, *Water pollution control, Federal government, Water resources development, Standards, Toxins, Thermal pollution, Law enforcement, Water quality standards, Governmental interrelations, Administrative agen-cies, Legal review, Public rights, Beneficial use.

The Hon. John D. Dingell of Michigan comments on the Environmental Protection Agency's recent efforts to gain support for the Senate's proposed amendment (S.2770) to the Federal Water Pollu-tion Control Act. A House-passed bill (H.R. 11896) to amend the Act is criticized as a weak bill designed to perpetuate the abatement theory. Included is a comparison of these two bills and comments on their goals and policies, standards, new source performance standards, enforcement, toxic and pretreatment requirements, clean lakes provisions, thermal pollution, waste treatment facility construction, permits, and citizen suits. Mr. Dingell calls attention to EPA's comment opposed to increasing the federal share for waste treatment works to more than 55 percent and EPA's silence on the subjects of citizen suits and standing. (Widman-Florida) W72-12584

BILL OF RIGHTS FOR LAKE MICHIGAN,

House, Washington, D.C.

J. D. Dingell. Congressional Record, Vol. 118, E4861-E4863 (daily ed.) May 9, 1972.

Descriptors: *Water pollution effects, *Illinois, *Lake Michigan, *Legislation, State jurisdiction, Water pollution sources, Legal aspects, Eutrophication, Environmental effects, Abatement, Land management, Land use, Land resources, Recreation, Permits, Adoption of practices, Impoundments, Landfills, Federal government, State

Testimony of Rep. Abner J. Mikva is presented in support of the proposed Bill of Rights for Lake Michigan, which has been presented to the Illinois state legislature. The bill is designed to prevent the severe pollution problem of Lake Erie from arising in Lake Michigan. The bill provides the tools to enforce anti-pollution measures. The bill would treat the lake and its adjoining shoreland and waterways as a comprehensive natural resource unit that must be considered from a total environmental perspective. Standards are not a problem because the bill would forbid any pollution of the lake. The bill provides for prevention instead of treatment. It would require consent of city and state government and the governor prior to any impoundment or fill of the lake. The bill would make recreational land use the highest and best use around the lake. The Nixon Administration is criticized for making promises regarding the spirit of environmental protection but for not carrying out the promises. For this reason the bill of rights must be enacted by the Illinois state legislature. (Grant-Florida) W72-12585

POLLUTED ESTUARY House, Washington, D.C.

G. Gude.

Congressional Record, Vol. 118, No. 75, H4320-H4321 (daily ed.) May 9, 1972.

Descriptors: *District of Columbia, *Potomac River, *Municipal water, *Municipal wastes, *Water quality control, Sewage, Disposal, Water pollution sources, Water quality, Estuaries, Estuarine environment, Currents (Water), Saline water-freshwater interfaces, Intakes, Water sources, Water supply, Water supply develop-ment, Viruses, Water pollution, Effluents.

The Potomac River south of Chain Bridge is technically not a river, but an estuary governed by the tides. The Washington drinking water supply is largely dependent upon the upper Potomac, although in recent years this has almost become in-adequate in dry seasons. The estuary has been proposed as the most likely source of emergency water and temporary facilities have been emplaced and more permanent ones planned. However, the estuary is heavily polluted with the sewage effluent from upstream. This pollution problem is discussed in detail. One corrective proposal is to pipe the estuarine water upstream of the normal intake point to dilute the effluent before it enters the drinking supply. Another proposal is to pump sewage effluent further downstream. Storm ru-noffs are another problem which must be solved. The problems of detecting and treating viruses in the water are discussed including the polio virus. which is very difficult to detect. One water quality expert regards the virus problem as not too important, pointing out that viruses have been in water supplies for years. (Grant-Florida) W72-12586

THE PACIFIC AQUEDUCT SYSTEM OF INTERCONTINENTAL WATER TRANSFER, Senate, Washington, D.C.

F. Moss.

Congressional Record, Vol. 118, No. 75, S7510-S7511 (daily ed.) May 9, 1972.

*Water allocation Descriptors: *Water allocation (Policy), *Aqueducts, *Water demand, *Inter-basin transfers, International joint commission, Water resources development, Columbia River, Colorado River Aqueduct, Colorado River Basin, California, Saline lakes, Saline water, Desalination, Sediment transport, Human population, Water supply development, Oregon, Nevada

The water shortage problems of the western United States are discussed along with proposed measures to alleviate the difficulties. One answer proposes a joint planning effort by the Unites States, Canada, and Mexico to solve the water al-location problems. The shortage of water in the western United States could be alleviated by diverting the excess water from the Frazier River in British Columbia to the Columbia River Basin and then down to California and eventually into the Colorado River Basin on Lake Mead. This would supply added water to areas of need in Oregon, agricultural and urban areas in central and southern California, and also Nevada. Supplying water to Nevada would open previously unusable areas for population expansion and would also prevent the increasing salinization of western waterbodies such as Lake Mead and the Colorado River. This salinization will eventually have an effect on land served by these waters. Replenishing the water supply is therefore of prime importance. (Grant-Florida) W72-12587

KEMP SPEAKS OUT FOR THE GREAT LAKES AND WATER RESOURCE PROJECTS FOR ERIE COUNTY, N.Y., House, Washington, D.C.

J. Kemp.

Congressional Record, Vol. 118, No. 80, H4675-H4678 (daily ed.) May 17, 1972.

Descriptors: *Legislation, *New York, *Great Lakes, *Government finance, Water resources development, Federal government, Economic justification, Administrative agencies, Water management (Applied), Projects, Annual costs, Multiple-purpose projects, Resource allocation, Project planning, Flood control, Watershed management.

Congressman Jack Kemp of New York speaks to the Congress on the Great Lakes and Water Resource Projects for Erie County, N.Y. Included in the Record is testimony before the Agricultural-Environmental and Consumer Protection Subcommittee of the House Committee on Appropriations, and testimony before the Subcommittee on Public Works of the same Committee. Congressman Kemp discusses projects including flood control in the Scajaquada watershed, Great Lakes-Saint Lawrence Seaway Navigation Season Extension, and miscellaneous water resource projects in Cayuga, Cazenovia, and Buffalo Creeks. Mr. Brandon, representing the New York State Urban Development Corporation, urges favorable action by the Subcommittee on Public Works on expediting the Ellicott Creek flood control project in New York State. (Widman-Florida) W72-12588

GREAT LAKES POLLUTION: A FRAMEWORK FOR ACTION.

Queen's Univ., Kingston (Ontario). School of aw.

For primary bibliographic entry see Field 05G. W72-12589

POLLUTION PREVENTION IN THE ARCTIC-NATIONAL AND MULTINATIONAL AP-PROACHES COMPARED, For primary bibliographic entry see Field 05G. W72-12590

NEW DIRECTIONS IN WATER QUALITY MANAGEMENT: A PROPOSAL FOR WISCON-SIN,

Wisconsin Senate, Madison. For primary bibliographic entry see Field 05G. W72-12591

TOWARD A STATE REMEDY FOR OIL SPILL DAMAGES: AN INSURANCE APPROACH. For primary bibliographic entry see Field 05G W72-12592

SEABED BOUNDARIES BETWEEN COASTAL STATES: THE EFFECT TO BE GIVEN ISLETS AS 'SPECIAL CIRCUMSTANCES',

International Lawyer, Vol 6, No 3, p 219-236, 1972. 13 ref.

Descriptors: *Boundaries (Property), *Continental shelf, *International law, *Ownership of beds, Continental margin, Boundary disputes, Legal aspects, Coastal areas, Islands, Marine geology, Law of the sea.

The question explored is whether a state which owns a small island off its mainland coast or the coast of its neighbor may demand that the coast of its islet, rather than its mainland, be the baseline from which the seabed boundary will be computed. It seems clear that recognition must be given to an islet, no matter how small, that is so close to, and identified with, a mainland or a major island as to be fairly included in the system of straight baselines uniting it with that major land mass. Isolated islands, irrespective of size, which are not only too distant to be in contact with the contiguous zone envelope of their owner's territo-ries, and which are uninhabited, should be disqualified. But an islet which is denied effect as a basepoint for the calculation of a median line as against an opposite coast, or the calculation of an equidistance line between adjacent states on the same coast, for demarcation of continental shelf same cuast, for demarcation of continental shelf boundaries, is to be accorded continental shelf rights in an area of the seabed and subsoil co-ex-tensive with its 12-mile contiguous zone. (Wal-dron-Florida) W72-12593

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FEDERAL COMMON LAW AND INTERSTATE

For primary bibliographic entry see Field 05G. W72-12594

LAW OF THE SEA NEGOTIATIONS 1971-1972-FROM INTERNATIONALISM TO NATIONALISM TO NALISM, State Univ., Baton Rouge. Law School.

San Diego Law Review, Vol 9, No 3, p 383-389, 1972.

Descriptors: *International law, *Fish management, *Water pollution control, *Non-consumptive use, Coordination, Water law, United Nations, Water pollution, International waters, Governments, Political aspects, Water resources development, Fisheries, Wildlife management, Abention of machine. Adoption of practices.

In this foreword to the Law of the Seas issue of the San Diego Law Review the articles presented are discussed as they relate to the three main areas of the seabed question: fisheries management, pollution control, and nonextractive uses of the seabed. Throughout these areas a trend away from international solutions to problems of ocean resource development and conservation and toward nationalistic solutions is perceived. This trend is due to the ascendant nationalism of the developing countries and the position of the United States Department of Defense, which seeks maximum mobility in the oceans. The articles on fisheries management contain proposals geared to the long-range objectives of international relations and cooperation, while the articles on water pollution stress the issue of where to place the emphasis and what objectives should be given priority. A final area discussed is that of non-extractive uses of the seabed, which includes such concepts as floating cities, giant port facili-ties, and underwater parks and aquatic preserver. (Widman-Florida) W72-12595

THE EFFICACY OF FEDERAL AND STATE CONTROL OF WATER POLLUTION IN INTRASTATE STREAMS, North Carolina Univ., Chapel Hill. School of Law. For primary bibliographic entry see Field 05G. W72.17506.

REFUSE ACT OF 1899-WILL IT CURB INDUS-

TRIAL WASTES.
For primary bibliographic entry see Field 05G.
W72-12597

RECENT DEVELOPMENTS IN THE LAW OF THE SEAS III: A SYNOPSIS, G. E. Arledge, A. A. Nadir, and R. L. O'Connell. San Diego Law Review, Vol 9, No 3, p 608-667, 1972. 94 ref.

Descriptors: *Law of the sea, *International law, *Oceans, *Legal review, Legal aspects, Political aspects, Fishing, Exploitation, Exploration, Oil spills, Water pollution sources, Continental shelf, Ownership of beds, Ships, Commercial fishing,

Drilling, Mining, Water pollution, Environmental effects, United Nations, Navigation.

This synopsis encompasses events occurring between March 1971 and February 1972, which were of legal significance to the development of the law of the sea. Legislation affecting conservation is discussed concerning oceanfront zoning, powerplant operation, ocean studies, wetland protection, and offshore drilling regulation. Some of the problems with international conservation of ocean fishing are discussed. Undersea mineral exocean fishing are discussed. Undersea mineral extraction such as petroleum and magnesium present a continuing regulatory problem. Domestic pollution resulting from oil spills and a variety of statutes and law suits involving pollution regulation are analyzed including the Marine Protection Act, ocean dumping regulations, and Coast Guard Oil Spill Rules. Developments in international pollution problems, particularly marine oil pollution, are described. A wide range of legal problems associated with the shipping industry are presented. Conflicts between nations over territorial sovereignty limits have intensified in the North Atlantic fishing banks and off the coasts of South lantic fishing banks and off the coasts of South America. Developments concerning the interna-tional seabed are discussed including Soviet seabed study plans, the Treaty Banning Emplace-ment of Nuclear Weapons on the Seabed, Agreements on Seabed Boundaries between Australia and Indonesia, and meetings of the United Nations Committee on the Peaceful Uses of the Seabed. (Grant-Florida) W72-12598

THE DONNYBROOK FAIR OF THE OCEANS,

D. P. Stang. San Diego Law Review, Vol 9, No 3, p 569-607, 1972. 33 ref, 3 append.

Descriptors: *Law of the sea, *International law, *United Nations, *International commissions, Continental margin, Fishing, Fisheries, Commercial fishing, Exploration, Exploitation, Mining, Legal aspects, Political aspects, Political constraints, Legal review, Regulation, Coasts, Water pollution, Research and development, Treaties,

The existing law of the sea is embodied in four Geneva conventions of 1958 dealing with the territorial sea and contiguous zone, the high seas, continental shelf, and fishing and conservation. This body of law is under much pressure as developing nation-states emerge and technology creates pollu-tion and enables nations to exploit undersea resources at greater depths. Items in need of reevaluation include the limits of the territorial sea. the precise limits of the continental shelf, regulation of foreign fishing fleets by coastal states, regulation of marine pollution by foreign states near a coastal state, regulation of foreign scientific near a coastal state, regulation of foreign scientific research by coastal states, exploitation rights, and the method of controlling exploitation. A major difference of viewpoint exists between developed and developing coastal states and between coastal and landlocked states. The political aspects of the bloc of developing nations led by Red China are discussed. The courses of action and points of discussion that are likely to develop at the upcom-ing 1973 United Nations Seaked Committee are ing 1973 United Nations Seabed Committee are also analyzed. (Grant-Florida) W72-12599

BRIDGING THE GAP TO INTERNATIONAL FISHERIES AGREEMENT: A GUIDE FOR UNI-LATERAL ACTION,

Oregon Univ., Eugene. School of Law. J. L. Jacobson.

San Diego Law Review, Vol 9, No 3, p 454-490, 1972, 121 ref.

Descriptors: *Fish management, *International law, *Water resources development, *Adoption of practices, Exploitation, Management, Regulation, Fishing gear, Marine fisheries, Water law, Water pollution, Commercial fishing, Decision making, Fisheries, Fishing, Water management (Applied).

A basic assumption is made that at least a few coastal nations will soon take unilateral action in the seas, ostensibly for the sake of conserving valuable food resources endangered by overfishing or pollution. Protective action by the coastal states must: (1) be a response to a demonstrable conservation crisis, (2) be concerned solely with protection of the endangered resource, (3) not unreasonably discriminate on the high seas against nationals of other nations, (4) carry an automatic termination date, and (5) be accompanied by a clear call for international agreement. Overexploitation and the desirability of an international agreement are discussed. The immediate tional agreement are discussed. The immediate solution is seen as careful unilateral action of various forms. Major obstacles and difficulties include legal obstacles under international law; difficulties in formulation of management methods, which include quotas, gear restrictions, limited entry, season restrictions, and area restriction; enforcement problems; and risk of over-response by other nations. (Widman-Florida)
W72-12600

A SECOND LOOK AT UNITED STATES FISHE-RIES MANAGEMENT, Miami Univ., Fla. School of Law.

T. A. Clingan, Jr. San Diego Law Review, Vol 9, No 3, p 432-453,

Descriptors: "Fisheries, "Fish management, "United States, "Regulation, Planning, Expansion, Decision making, Water resources development, Programs, Administrative agencies, Water management (Applied), Fishing, Fishing gear, Marine fisheries, Commercial fishing, Manage-

An overview of United States fisheries manage-An overview of United States Institute manage-ment is presented, including a brief report on the status of fishing and fisheries. U.S. fisheries, in terms of total catch, will probably not expand dra-matically in the foreseeable future, while the de-mand for fish products will remain high. In the section on international management programs and problems the several basic patterns taken by fisheproblems the several basic patterns taken by fisheries as identified by Larkin and Larkin's proposal to meet the problems here are discussed. Domestic goals for fisheries management are discussed also. National guidelines should include only the three basic biological, economic, and social factors, with the precise balance being worked out as close to the working level as possible, and with participation by decision makers having strong industry representation. In the section on mechanisms for fisheries such topics as gear, season length. for fisheries such topics as gear, season length, quotas, and limitation of entry are discussed. A structure is proposed for a U.S. management/regulation system and the need for assistance programs in this area is described. (Widman-Florida) W72-12601

PROPOSAL FOR A DEMONSTRATION WATER QUALITY MANAGEMENT PROGRAM ON THE HOLSTON RIVER IN EASTERN TENNESSEE, Cornell Univ., Ithaca, n.y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05G.
W72-12602

TORTIOUS WATER AND LAND USE IN THE BIG CYPRESS SWAMP,
For primary bibliographic entry see Field 04A.
W72-12605

SUPREME COURT DECLINES ORIGINAL JURISDICTION IN LAKE ERIE POLLUTION

For primary bibliographic entry see Field 05G.

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

W72-12606

ESTABLISH A DEPARTMENT OF NATURAL RESOURCES.

Hearing—Comm. on Interior and Insular Affairs, U.S. Senate, 92d Cong, 2d Sess, January 28, 1972.

Descriptors: *Administrative agencies, *Legislation, *Natural resources, *Energy, Adoption of practices, Economics, Federal government, Federal jurisdiction, Administration, political aspects, Social aspects, Legal aspects.

Testimony before the Senate Interior and Insular Affairs Committee is presented on the proposal to create a Department of Natural Resources. Specifically testimony relates to the Nation's energy supply and to the administrative organization within the new department for managing the Nation's energy supplies. The new department would consist of various agencies from the Departments of Interior and Transportation and certain functions of the Atomic Energy Commission. Discussion concerns the feasibility of and advantages of such an organization and the organizational and management problems presented. The Appendix includes a position paper on the Energy and Mineral Resources Administration in the proposed Department of Natural Resources and a proposed bill to create such a department. (Grant-Florida) W72-12607

SECTION 169 OF THE INTERNAL REVENUE CODE: AN INCOME TAX SUBSIDY FOR THE CONTROL OF POLLUTION, Northeastern Univ., Boston, Mass. School of Law.

For primary bibliographic entry see Field 05G. W72-12608

SAVING THE LAND-WATER EDGE FROM RECREATION, FOR RECREATION, Fordham Univ., Bronx, N.Y. School of Law. L. A. Teclaff, and E. Teclaff.
Arizona Law Review, Vol 14, No 1, p 39-64, 1972. 125 ref.

Descriptors: *Recreation, *Environmental effects, *Coasts, *Common law, Public rights, Navigation, Riparian rights, Appropriation, Federal government, State governments, Comprehensive planning, Water resources development, Adoption of practices, Recreation facilities, Balance of nature, Legislation, Conservation.

Water-based recreation depends heavily on the land-water edge and is exacting a significant toll from this ecologically fragile area. The nature of the recreational threat to the land-water edge is examined. The effects of common law water rights such as public rights and navigability, alienation of trustland under navigable waters, and riparian and appropriation doctrines are discussed. Both federal and state governments have encouraged the public use of the edge, but these governmental acquisitions represent only a tiny inroad into the amount of privately held land located in the edge zone. Legal constraints on the use of the edge are examined including the Wild and Scenic Rivers Act of 1968: the Rivers and Harbors Act of 1899: the Fish and Wildlife Coordination Act: the National Environmental Policy Act; state plans such as the San Francisco Bay Plan, Wisconsin's shore-land zoning system, and the Tahoe Basin Com-pact; the 1969 proposals of the Commission on Marine Science, Engineering, and Resources; and the proposed National Land Use Policy Act of 1971. Possible solutions are advanced for resolving the conflict between use and conservation of the edge. (Widman-Florida)
W72-12609

REGIONAL WATER SUPPLY PLANNING ACT. N.C. Gen. Stat. secs. 162A-20 thru 162A-25 (Supp. 1971).

Descriptors: *Legislation, *North Carolina, *Water supply, *Planning, *Financing, Local governments, State governments, Water resources development, Project planning, Regions, Legal aspects, Administrative agencies, Administration, Economies of scale, Efficiencies, Governmental interrelations, Comprehensive planning, Water supply development.

The needs for regional water supply systems in North Carolina are outlined. A regional water supply system is defined. State government functions with respect to coordinated functions include identification of major sources of raw water supply for regional systems, identification of areas for development of regional systems, establishment of regionalization priorities, development of plans for connecting regional systems to major supply sources, review of plans to insure compatibility, administration of a state program of fin cial assistance, and provision for technical assistance to local and regional agencies. A revolving fund is established in the Department of Administration for the purpose of making advances to local governments for advance engineering planning. Conditions for granting advances include suitability of the proposed area for regional water supply development, assurance of the applicant of long-range planning to meet needs for high quality regional water service, coorination of land and water supply planning, and employment by the ap-plicant of a licensed engineer to prepare a comprehensive water supply plan to coordinate vari-ous technical aspects. Additionally the applicant must show reasonable availability of construction funds and reasonable assurance that the project will be undertaken. (Grant-Florida) W72-12610

WATER BANK PROGRAM. Federal Register, Vol 37, No 99, p 10337-10341, May 1972.

Descriptors: "Wetlands, "Migratory birds, "Waterfowl, "Regulation, Legislation, Water allocation (Policy), Administrative agencies, Legal aspects, Social aspects, Institutions, Flood control, Erosion, Water quality control, Surface waters, Adoption of practices, Wildlife, Water conservation.

Identifiers: "Water Bank Act.

Regulations are issued for the Water Bank Program for 1972 pursuant to the Water Bank Act, 16 U.S.C. 1301. The regulations set forth the terms and conditions under which persons in selected areas having wetlands with a high potential for migratory waterfowl nesting and breeding may enter into 10 year agreements with the Secretary of Agriculture. Under the agreements annual payments are made for the conservation of water on specified wetlands. The specified wetlands are developed in cooperation with the local Soil and Water Conservation District. The program is designed to conserve surface waters, preserve waterfowl habitat, reduce erosion, and contribute to flood and water quality control. The regulations cover the following areas: administration, geographical applicability, eligibility, use of designated land, agreement provisions, monitoring, compliance, payments, prohibited practices, amendments of agreements, successors-in-interest, and other legal ramifications of the program. (Grant-Florida) W72-12611

THE RESTORATION OF A RIVER,

J. G. Mitchell. Saturday Review, Vol 55, p 35-37, April 8, 1972. 2 Descriptors: "Hudson River, "Water quality control, "Rivers and Harbors Act, "Legal aspects, Penalties (Legal), Administrative agencies, Adoption of practices, Pollution abatement, Pollutant identification, Municipal wastes, Federal government, State governments, Social aspects, Economic feasibility, Heated water, Water resources development, New York.

The Hudson River cleanup began when a \$1 billion New York State bond issue was passed for a state-wide Pure Waters Program. Although economic, political, and organizational barriers have proved immense, citizen groups and the law have become increasingly active. The Refuse Act of 1899 has been particularly useful in this area. The Act prohibits the unlicensed dumping of wastes in a navigable waterway, provides for violators to be fined, and stipulates that part of the fine be turned over to the person or persons who supplied the evidence leading to conviction. Cleaning up the river's direct industrial discharges is just a start, however, as indirect discharge of industrial waste continues barely abated. Cleaning up municipal pollution itself remains a problem. Because federal funds are scarce New York State has been forced to prefinance the federal share, which has sharply decreased the state's own funds. The most complicated problem is the increasing potential for overloading the river with waste heat from power plants. Additionally, current water resource development plans may endanger the Hudson's headwaters in the Adirondacks. (Widman-Florida) W72-12612

SHOWDOWN ON DELAWARE BAY,

S. Linusay. Saturday Review, Vol 55, p 34, 36-39, March 18, 1972. 1 map, 3 photo.

Descriptors: *Coastal structures, *Permits, *Delaware, Legislation, Water management (Applied), Coastal marshes, Comprehensive planning, Administrative agencies, Adoption of practices, Regulation, Political aspects, Social aspects, State governments, Water resources development, Delaware River, Coasts.

In 1971 Delaware attracted nationwide attention by its Coastal Zone Act, which barred heavy manufacturing industry from locating in a two mile wide strip along the state's coastline. It specifically banned oil refineries, petrochemical complexes, basic steel and paper mills, and marine terminals for the transshipment of liquid and solid bulk materials. It welcomed under a permit system such nonpolluting enterprises as automobile assembly plants, and garment, jewelry, and leather-goods factories. In this interview Governor Paterson of Delaware discusses the importance of the Delaware Bay and River to the major East Coast markets. The interview also examines the question of whether to use the same land for recreation and tourism or industry, the possibility of allowing offshore oil terminals in the future, the energy de-mand, and the radioactive waste disposal problem. The Governor also discusses control over coastal development for tourism and recreation, pop tion growth, siting of oil refineries and steel and paper mills, the conflict between growth and environmental protection, the future of Delaware, whomened protection, the future of Delawater the possibility of a national policy concerning land use and energy growth, and the role of the private citizen in this area. (Widman-Florida) W72-12613

NATURAL RESOURCES DEFENSE COUNCIL V. MORTON (SCOPE OF APPLICATION OF NATIONAL ENVIRONMENTAL POLICY ACT). 458 F.24 827-846 (D.C. Cir. 1972).

Descriptors: *United States, *Administrative decisions, *Oil pollution, *Environmental effects, Legal aspects, Legal review, Legislation, Judicial decisions, Decision making, Administrative agen-

cies, Regulation, Oil industry, Federal govern-ment, Adjudication procedure, Water law, Ad-ministration, Water pollution, Water pollution sources, Oil spills, Beds under water, Water resources development.
Identifiers: *National Environmental Policy Act.

Plaintiff conservation group brought suit for a preliminary injunction against defendant Interior Department to prevent an oil and gas lease sale of leases to some eighty tracts of submerged lands. Defendant initiated the sale and filed an environmental impact statement. Plaintiffs contended that the statement failed to give adequate consideration to alternatives. Defendant contended that the National Environmental Policy Act does not require impact statements for discuss environmental conimpact statements to discuss environmental conimpact statements to discuss environmental consequences of suggested alternatives, that alternatives which are not complete solutions to the problem do not have to be included, and that an alternative requiring legislative implementation is beyond the scope of the impact statement. The United States Court of Appeals for the District of Columbia held that Congress in enactment of the National Environmental Policy Act contemplated that impact statements would constitute sources of information for making relevant decisions as to that impact statements would constitute sources or information for making relevant decisions as to evaluation of benefits of proposed projects in light of environmental risks. The court held that the Interior Department, to comply with NEPA, must present alternatives and environmental risks interest the environmental risks in the court of th cident to such alternatives. The court denied the motion for reversal of the lower court's decision. Excerpts from the impact statement are included in an appendix. (Brackins-Florida) W72-12614

AN ACT...PROVIDING FOR THE POSTING, AND FORFEITURE...OF A BOND BY ANY VES-SEL IN OR ENTERING UPON THE WATERS OF THE STATE FOR THE PURPOSES OF DISCHARGING OR RECEIVING A CARGO OF

Maryland Laws ch. 504 (1971). *Maryland, *Water pollution control, *Legislation, *Water pollution sources, Abatement, State governments, Adminis-trative agencies, Water law, Navigable waters, Oily water, Oil wastes, Water quality control, Pol-lution abatement.

Chapter 504 provides for the posting and forfei-ture, on certain conditions, of a bond by any vesture, on certain conditions, of a bond by any ves-sel in or entering upon the waters of the state for the purposes of discharging or receiving a cargo of any bulk oil. The Act also provides that the com-pensatory fee collectible from a person responsi-ble for oil spillage shall cover the cost of eliminat-ing the residue of oil spillage and the cost of restor-ing areas damaged to their original condition. This compensatory fee shall be charged and collected by the Maryland Port Authority and the Departby the Maryland Port Authority and the Depart-ment of Natural Resources. Any person responsi-ble for oil spillage shall be liable to any other person for any damages to his real or personal proper-ty directly caused by the spillage. (Waldron-

AN ACT...FOR THE PRESERVATION AND IM-PROVEMENT OF THE POTOMAC RIVER BASIN.

Maryland Laws ch. 30 (1971).

Descriptors: *River basin development, *Water shortage, *Maryland, *Water quality control, Water law, Local governments, River basin commissions, District of Columbia, Flood control, Planning, Recreation facilities, Water resources development, Long-term planning, Legislation, Federal government, State governments, Adminis-trative agencies, Droughts. Identifiers: *Potomac River Basin.

The Potomac River Basin has experienced many years of drought which severely damaged the productivity of agriculture and drastically reduced the flow of the river, threatening water supplies throughout the basin and particularly in the Washington metropolitan area. For these and other reasons the President asked the Secretary of the Interior to work with the affected state and local governments and the District of Columbia to prepare a program which would include provisions for cleaning up the river, protecting its natural beauty, and providing adequate recreational facilities. These interested parties formed the Potomac River Basin Advisory Committee. The Committee prepared a draft of an interstate-federal compact calling for the creation of the Potomac River Basin Commission. Senate Bill 91 presents this compact to the Maryland legislature for approval. The Bill also provides that the Maryland Potomac Water Authority shall be kept regularly informed of the activities of the Potomac River Basin Commission and shall have continuous opportunity to advise the Maryland member of the Commission. (Waldron-Florida)

AN ACT...TO AUTHORIZE A WATER POLLU-TION ABATEMENT GRANT PROGRAM.

Laws of Mississippi ch. 456 (1971).

Descriptors: *Grants, *Water pollution control, *Legislation, *Mississippi, Abatement, Financing, Administrative agencies, Water law, State governments, Local governments, Construction costs, Sewage treatment, Waste treatment, Financing.

House Bill 81 amends the Mississippi Code of 1942 to designate the Mississippi Air and Water Pollution Control Commission as the administering agent for the state's water pollution abatement program; to delete expired provisions; to authorize a water pollution abatement grant program; and for related purposes. The water pollution abatement grant program shall make grants available for construction to any political subdivision legally authorized to own, maintain and operate a sewage, industrial waste or other waste collection, transport, treatment and disposal program. No recipient shall receive from state funds any grant in excess of 25% of the cost of construction. No grant shall be made via this act unless the project is in conor 25% of the cost of construction. No grant shail be made via this act unless the project is in conformity with the State Water Pollution Control Plan and has been certified by the Air and Water Control Commission as entitled to priority over other eligible projects. Grants-in-aid of construction in amounts of \$500,000 or less shall be made to the eligible political subdivision immediately upon approval of the award by the appropriate federal agency or agencies. (Waldron-Florida) W72-12617

AN ACT TO AMEND IC 1971, 13-1-6, CON-CERNING WATER POLLUTION CONTROL. Indiana Laws no 176 (1971).

Descriptors: *Treatment facilities, *Indiana, *Legislation, *Water pollution control, Water treatment, Administrative agencies, Public health, Waste treatment, Water distribution (Applied), Public utilities, Permits, Operation and main-

Public Law No. 176 amends the former law to pro-vide that the state health commissioner shall clas-sify all water and wastewater treatment plants and water distribution systems actually used or in-tended for use. Classification shall take due regard tended for use. Classification shall take due regard of the size, type, character of wastes or water to be treated, and other physical conditions affecting such treatment plants and distribution systems. The commissioner shall certify persons as to their qualifications to supervise successfully the operation of water or wastewater treatment plants and water distribution systems. The commissioner may revoke the certificate of an operator following a hearing before the commissioner or designated representative. After July 1, 1972, all water or wastewater treatment plants and water distribution systems, whether publicly or privately owned, must be under the supervision of an operator whose competency is certified by the commissioner. (Waldron-Florida) W72-12618

TOWN OF HEMPSTEAD V. OCEANSIDE YACHT HARBOR, INC. (UPLAND OWNER'S RIGHT OF ACCESS).
328 N.Y.S.2d 894-898 (App. Div. N.Y. 1972).

Descriptors: "Right-of-way, "Riparian rights, "Marinas, "New York, Judicial decisions, Legal aspects, Access routes, Public access, Reasonable use, Recreation, Water law, Navigation, Trespass, Adjacent landowners, Piers, Boundaries (Property), Navigable waters.

Plaintiffs sued to recover reasonable rental for the use and occupation of their underwater land by defendant in the operation of its business as a marina. By colonial grants palantiffs are the owners of the land under water adjacent to the upland owned by defendant, upon which upland is erected a bulkhead from which ramps are attached to floating docks. Plaintiffs claimed that defendant, through the construction of the mooring slips, went beyond the riparian rights of an upland owner and trespassed on plaintiffs' rights. Defendant contended that his riparian rights included the activity in which he engaged. The lower court found the plaintiffs; the Appellate Division reversed and held defendant had the right to maintain the docks. The court stated that defendant had a right of access to and from the channel over plaintiffs' offshore, as long as exercised in a a right of access to and from the channel over plaintiffs' offshore, as long as exercised in a reasonable manner. This right included the power to build a pier or dock for the use of the public or owner. The right of access may be shared with others for purposes unrelated to use of the upland, not to extend to purposes extrinsic to commerce and navigation. The upland owner may erect more than one dock, as long as not unreasonable, and lease these to third parties. The rental of mooring slips to the public did not constitute an unreasonable exercise of dominion over underwater land in view of the state policy toward encouragement of development of waterfronts. (Ilkson-Florida) W72-12619

UNITED STATES V. GENOA COOPERATIVE CREAMERY CO. (REFUSE ACT SEWAGE EXCEPTION). 336 F. Supp. 539-542 (W. D. Wis. 1972).

Descriptors: "Navigable rivers, "Waste disposal, "Sewage, "Industrial wastes, "Rivers and Harbors Act, Judicial decisions, Sewers, Water pollution, Industrial plants, Wastes, Navigable waters, Mis-sissippi River, Legal aspects, Law enforcement, Water law, Municipal wastes, Water pollution sources, Legislation, Food processing industry, "Wisconsin."

Defendant company is charged with discharging milk wastes from its creamery into the Mississippi River, a navigable river, in violation of the Rivers and Harbors Appropriation Act. The discharged liquid contained milk wastes and wash water with suspended solids from the rinsing of the floor, vats and utensils of the creamery. Defendant claimed that the refuse matter it discharged was within the exception to the Act's proscription: 'other than flowing from streets and sewers and passing therefrom in a liquid state into any navigable water'. Defendant alleged that its underground tanks and pipes constituted a sewer from which its refuse flowed in a liquid state although containing suspended solids. Therefore, defendant reasoned, its refuse was exempt from penalty. The United States District Court found that defendant's

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Group 6E-Water Law and Institutions

discharge was refuse matter and that not all refuse flowing from sewers in a liquid state is exempt, but only that which is actually sewage, that is, human, animal and domestic wastes as distinguished from industrial wastes. Thus, even assuming in the in-stant case that defendant's discharge system was a sewer discharging matter in a liquid state, the refuse matter it discharged was not within the exemption since it was not sewage. Navigation need not be impaired for there to be a violation of the Act. Defendant was adjudged guilty. (Ilkson-Florida) W72-12620

LAND SUBDIVISIONS--MUNICIPAL REGULA-Maine Public Laws ch 454 (1971).

Descriptors: *Maine, *Legislation, *Land use, Planning, Waste disposal, Sewage disposal, Municipal wastes, Solid wastes, Water pollution, Water pollution control, Water supply, Legal aspects, Regulation, Administration, governments, Urbanization, Erosion, management, Law enforcement. Land

The Act provides that no land in a subdivision may be conveyed or offered or agreed to be conveyed without the approval of the proper local officials. When reviewing subdivisions for approval, consideration shall be given to a specified list of criteria, including whether the proposed subdivision will result in undue water pollution, considering the ability of the soils and streams to support waste disposal; whether there will be an unreasonable burden on the water supply; soil erosion or reduction in the ability of the land to hold water; whether the subdivision will provide for adequate solid and sewage waste disposal, or if municipal services are to be used, whether it will cause an unreasonable buden on the municipality's ability to dispose of its wastes. Approval for subdivisions situated within 250 feet of any pond, lake, river, or tidal waters, must consider whether the proposed subdivision would adversely affect the quality of such body of water or unreasonably affect the shoreline of such body of water. Provisions are included for fines and injuctions for en-forcement of the Act. (Brackins-Florida) W72-12621

ENVIRONMENTAL IMPROVEMENT COMMIS-SION LAW. Maine Public Laws ch 461 (1971).

Descriptors: *Maine, *Water pollution sources, *Permits, *Waste disposal, *Legislation, Legal aspects, Water law, Sewage disposal, Municipal wastes, Industrial wastes, State governments, Water quality, Water quality standards, Water quality control, Water pollution, Monitoring, Waste dilution, Riparian rights, Regulation.

The Act provides that no one shall discharge any waste, refuse, effluent or sewage into any water without obtaining a license therefor from the Environmental Improvement Commission. Exemptions will be granted for municipal waste discharges as the same existed on September 1, 1959, and for other discharges as such discharge existed in quality or quantity on August 8, 1953. Exemptions may be lost by changes in quantity or quality of discharge or by transfer of ownership of the source. All exemptions will be void on October 1, 1976. The Commission shall issue a license upon a finding that the discharge will receive the best practical treatment and that it will not lower the water quality of the receiving body below its classification, or the classification which the Commission expects to recommend for it. Procedure for license application is included with provisions for notice and a public hearing. The Commission is delegated authority for inspections and monitoring of sources. No riparian owner shall have a cause of action against any licensee unless the licensed discharge will either of itself or in combination with existing discharges lower the statutory classification of said body of water and cause actual damages to such owner. (Brackins-Florida)

COASTAL WETLANDS--PROTECTION. Maine Public Laws ch 541 (1971).

Descriptors: *Maine, *Legislation, *Coastal marshes, *Estuaries, *Wetlands, Coastal plains, Legal aspects, Water law, Local governments, Eminent domain, Administration, Dredging, Sewage disposal Water pollution, Water resources development, Administrative agencies, Water policy. Penalties (Legal).

The Wetlands Control Board may adopt orders regulating, restricting, or prohibiting dredging, filling removing or altering of any coastal wetland or draining or depositing sanitary sewage or any other pollutant on any coastal wetland. Provisions are included for notice and hearing to any affected party. Copies of any such order shall be recorded in the registry of deeds for the county in which said wetlands are located and mailed to each affected landowner. The exclusive procedure for appeals is through the Superior Court in the proper county. If a decree has been entered providing that an order of the Board shall not apply to the wetland involved in any appeal, then the Board may provide for the acquisition of the wetland by eminent domain if it determines the acquisition is justified by an emergency situation posing a threat to the public safety, health and welfare, to the protection of public or private property, to public or private salt water supplies or to estuarine or marine fisheries. Provisions are included for fines and injunctions in the event of violations of the Act or an order of the Board. (Brackins-Florida) W72-12623

SANITARY WATER BOARD V. HARMAR COAL CO. (APPLICATION OF CLEAN STREAMS LAW TO DRAINAGE OF MINES). 285 A.2d 898-904 (Commw. Ct. Pa. 1972)

Descriptors: *Administrative agencies, *Pennsylvania, *Coal mine wastes, *Mine water, Judicial decisions, Water law, Mine drainage, Water pollution sources, Legislation, Stream improvement, Appeals, Legal review, Legal aspects.

Plaintiff coal company sought to obtain a permit to pump water from an adjacent inactive mine. Plaintiff did not own the inactive mine, but the accumulation of water in the adjacent mine posed a threat to its mine. Plaintiff obtained a permit from the Department of Health to pump the water into a creek. The Sanitary Water Board disapproved the permit. The Board's administrative decision was reversed as it was held to be unsupported by sub-stantial evidence. The Commonwealth Court of Pennsylvania also held that the Clean Streams Law applies only to mine operators who own the mine from which the water is pumped. The court noted that no aquatic study was made by the Board. The court stated that the Board must present convincing evidence when it refuses a permit. The Board's own report showed that if the pumping ceased, the abandoned mine would fill more rapidly than plaintiff's mine and a ground water discharge would result into the same stream into which the water was then being pumped. (Waldron-Florida) W72-12625

TOWNSHIP OF SALISBURY V. VITO (RIGHT OF LANDOWNER TO MAINTAIN POND). 285 A.2d 529-532 (Pa. 1971).

Descriptors: *Pennsylvania, *Municipal water, *Overflow, *Judicial decisions, Cities, Legislation, Right-of-way, Highways, Drainage, Farm

ponds, Watercourses (Legal), Streams, Appeals, Ponds.

Plaintiff town, pursuant to a statute, sought to en-join defendant landowners from discharging water onto a city road. The statute provided that no peronto a city road. The statute provided that no per-son shall interfere with any drain, ditch, water-course, or drainage facility in a township without first submitting suitable plans to the township commission. Defendants dug two ponds on their property. Even on dry days one of the ponds over-flowed its banks onto the city road. The pond and a fence encroached upon the right-of-way of the road. Defendants channeled water into the pond from a stream flowing on or close to defendants' land. The lower court, upon a plea by plaintiff for general relief, had ordered defendants to fill in their pond, even though plaintiff had not asked specifically for this relief. The Supreme Court of Pennsylvania perpetually enjoined defendants from discharging water from their land onto a public road, from diverting water into their pond, and from interfering with the flow of the stream. The chancellor's requirement that defendants fill in their pond was overruled. Any part of a chancel-lor's decision must be supported by the record. The defendants were held to have the right to maintain a proper pond on their premises. (Waldron-Florida) W72-12626

HILTON V. SPECIAL BOARD (AUTHORITY OF SPECIAL BOARD TO ALLOW LANDFILL AND CONSTRUCTION OF PIER). 284 A.2d 917-920 (N. H. 1971).

Descriptors: *New Hampshire, *Lake shores, *Administrative agencies, *Jurisdiction, Swamps, Judicial decisions, Appeals, Water law, Permits, Beaches, Piers, Recreation facilities, Land ownership, Water rights, Avulsion, Land forming.

The owner of land adjacent to a public lake received permission from the Special Board to fill certain swampy areas along the shore of the lake for the purpose of creating a beach and building a pier which would provide docking facilities for thirty boats. Plaintiffs objected to the approved plan and appealed, claiming that defendant Special Board had misconstrued its authority. Plaintiffs argued that the adjacent landowners proposed to acquire land from the public waters and should have petitioned the Governor and Council. The court held that the permit granted, as far as the proposed beach was concerned, would not result in the acquisition of land from public waters and therefore was properly considered by the Special Board. However, the court held that the Special Board exceeded its jurisdiction by granting a per-mit for construction of the pier. The court intimated that only the Governor and Council could grant a permit for such a large pier. (Waldron-Florida) W72-12627

CITY OF COLUMBUS V. FARM BUREAU COOPERATIVE ASS'N. (LIABILITY FOR ALTERATION OF DRAINAGE THROUGH EMINENT DOMAIN). 273 N.E.2d 888-893 (Ct. App. Ohio 1971).

Descriptors: *Easements, *Judicial decisions, *Eminent domain, *Urban drainage, *Culverts, Legal aspects, Appropriation, Flooding, Drainage, Runoff, Conveyance structures, Drains, Surface drainage, Ditches, Urban runoff, Storm runoff, Floodflow, *Ohio.

Plaintiff city appropriated land from defendant landowner for a new and larger drainage culvert. Drainage waters from plaintiff's present culvert flowed naturally across defendant's land through an existing ditch. Only a small portion of defendant's property would be taken for the improvement. Defendant contended the changes contem-

plated would so accelerate the flow as to cause flooding of its property and that it should be awarded damages accordingly. The Ohio Court of Appeals held that the city had a right to improve Appeals held that the city had a right to improve the existing ditch so as to increase the volume and accelerate the flow of water without becoming liable to defendant for consequential damages to the residue of defendant's land, such damages being damnum absque injuria. But since plaintiff was taking another portion of defendant's land, the consequential damages become compensable. Therefore, the judgment of the trial court was reversed and the case remanded for a new trial. (Brackins-Florida)

SUBDIVISION PLANNING THROUGH WATER REGULATION IN NEW MEXICO, New Mexico Univ., Albuquerque. Coll. of Law. For primary bibliographic entry see Field 04C. W72-12831

WATER CENTER ORGANIZATION AND WATER CENTER ORGANIZATION AND MANAGEMENT, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. For primary bibliographic entry see Field 06B. W72-12954

6F. Nonstructural Alternatives

THE USE OF DETAILED SOILS INFORMATION FOR DELINEATING AND REGULATING FLOOD PLAINS: LEGAL AND ADMINISTRATIVE CONSIDERATIONS, Wisconsin Univ., Madison. Water Resources

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Available from the National Technical Informa-tion Service as PB-211 324, \$3.00 in paper copy, \$0.95 in microfiche. Wisconsin Water Resources Center, Technical Completion Report 1972. 66 p, 5 fig, 6 append. OWRR B-002-WIS (13).

Descriptors: *Flood plain zoning, *Flood plains, *Flood stages, *Indirect flood measurement, *Regional flood, *Legislation, *Water law, *Soil horizons, *Soil classification, *Soil formation, *Soil surveys, *Wisconsin.
Identifiers: *Soil maps.

The preferred method for establishing flood zones is by means of detailed engineering flood predic-tions and hydraulic studies; however, there are situations where such studies will be delayed for a studentons where such studies will be declayed for a number of years. Rather than not regulate areas such as scattered flood plains used for recreation and agriculture, detailed soil survey information can be used, especially in mature landscapes, to delineate regulatory flood hazard areas. Unfortunably interpretation of the flood plain press; in the contraction of the flood plains are in the contraction of the c nately interpretation of the flood plain area is less accurate in glaciated areas with broad flat flood plains or where man-made obstructions have plains or where man-made obstructions have changed the natural stream flow. Subject to these limitations, soils information can be used to delineate the boundaries of the regulatory flood plain to an acceptable degree of accuracy. The legal considerations relevant to flood plain zoning, as well as the advantages and limitations of using soils information for establishing flood plains are identified. Wisconsin law requires counties, cities and villages to adopt effective flood plain zoning ordinances, and the code recognizes the use of detailed soil maps for delineation of flood areas. Of the 30 counties that have adopted ordinances, 10 counties have used the detailed soil survey as the predominant method for delineation in rural areas. (See also W72-12655) (Kerrigan-Wisconsin)

DEVELOPMENT OF NEW TECHNIQUES FOR DELINEATION OF FLOOD PLAIN HAZARD

ZONES - PART I: BY MEANS OF DETAILED SOIL SURVEYS - PART II: BY MEANS OF AIR--PHOTO INTERPRETATION, Wisconsin Univ., Madison. Water Resources

G. B. Lee, D. E. Parker, D. A. Yanggen, and C. J. Milfred.

Mulred. Available from the National Technical Informa-tion Service as PB-211 325, \$3.00 in paper copy, \$0.95 in microfiche. Wisconsin Water Resources Center, Madison, Technical Completion Report, 1972. 90 p, 5 fig, 14 tab, 39 ref. OWRR B-002-WIS

Descriptors: "Flood plain zoning, "Land use, "Flood plains, "Historic floods, "Flood frequency, "Indirect flood measurement, Soil profiles, "Non-structural alternatives, "Alluvium. Identifiers: "Soil interpretations, "Airphoto interpretations, "Soil maps.

Part I describes investigations designed to evaluate interpretations of detailed soil maps, as a means of determining flood plain boundaries for regulatory purposes. Part II describes similar studies based on interpretation of airphotos. Six Wisconsin sites were studied. Boundaries of 100 year floods determined by engineering methods were used as a basis of comparison. Results showed (Part I) that reasonably acquirate boundaries. showed (Part I) that reasonably accurate boundaries of 100 year floods can be drawn in many places by interpretation of detailed soil maps. Greatest accuracy is achieved in relatively mature undisturbed landscapes. The method is low cost, rapid and particularly applicable to rural areas. It is recommended that the interpretation of maps be done by an experienced soil surveyor, that field checks be made, and that ancillary information be used to the fullest extent possible. Greater accuracy could be achieved by improved design of soil maps. Results of airphoto studies (Part II) showed that flood plain boundaries could also be drawn by interpretation of aerial photographs, in areas where physiographic features were distinct. Color and panchromatic imagery were equally accurate. Color allowed for more rapid interpretation. Land use regulations for floodplains delineated by interpretation of soil maps or airphotos should contain provisions for on-site investigations of questionable areas. (See also W72-12654) (Lee-Wisconsin) W72-12655

6G. Ecologic Impact of Water Development

ENVIRONMENTAL MATTERS CONCERNING NUCLEAR ELECTRICAL POWER PRODUC-TION.

Office of Environmental Affairs (AEC), Washing-For primary bibliographic entry see Field 05G. W72-12461

METEOROLOGICAL EFFECTS OF THE HEAT METEOROLOGICAL EFFECTS OF THE HEAT AND MOISTURE PRODUCED BY MAN, National Oceanic and Atmospheric Administra-tion, Oak Ridge, Tenn. Air Resources Atmospher-ic Turbulence and Diffusion Lab. For primary bibliographic entry see Field 05A.

A CASE STUDY: THE NATURE OF THE CON-A CASE STUDY: THE NATURE OF THE CONFLICT EXISTING BETWEEN ECONOMIC
DEVELOPMENT AND ENVIRONMENTAL
QUALITY IN PUERTO RICO.-THE APPROACH
AND STRATEGY BEING DEVELOPED,
Puerto Rico Dept. of Public Works, San Juan.
For primary bibliographic entry see Field 06B. SPOKANE RIVER PROJECT (DRAFT EN-VIRONMENTAL STATEMENT). Federal Power Commission, Washington, D.C. For primary bibliographic entry see Field 08C. W72-12603

GULF INTRACOASTAL WATERWAY, TEXAS SECTION, (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Galveston, Tex. For primary bibliographic entry see Field 04A.

ATLANTIC CITY ELECTRIC COMPANY, B. L. ENGLAND STATION—UNIT NO. 3, BEESLEY'S POINT, CAPE MAY COUNTY, NEW JERSEY, GREAT EGG HARBOR BAY (DRAFT ENVIRONMENTAL IMPACT STATEMENT), Army Engineer District, Philadelphia, Pa. For primary bibliographic entry see Field 08C. W72-12628

DISTRICT OF COLUMBIA WATER POLLU-TION CONTROL PLANT (EXPANSION AND UPGRADING), (DRAFT ENVIRONMENTAL IM-PACT STATEMENT). Environmental Protection Agency, Philadelphia, Pa. Region III. For primary bibliographic entry see Field 05D. W72-12630

ECOLOGICAL IMPACT RESOURCE DEVELOPMENTS. WATER Bureau of Reclamation, Denver, Colo. D. A. Hoffman. Bureau of Reclamation Report REC-ERC-72-17, June 1972. 28 p, 13 fig, 4 tab, 34 ref.

Descriptors: *Ecology, *Water quality, *Water resources development, *Highway effects, *Canal construction, *Reservoir operation, Bibliographies, Environmental effects, Planning, Aqualic environment, Fish, Natural resources, Hydraulic models, Spoil banks, Reservoirs, Natural resources, Limnology, Stream fisheries, Stream Identifiers: McClusky Canal, N. Dak.

Four papers describe a sequence of ecological impact analysis, ranging from predicting the con-sequences of planned management programs to descriptions and evaluations of ongoing programs. Use of preproject ecological surveys, bioassays, and laboratory scale models are described. Structures to increase fish habitat in changed river channels are evaluated; recommendations for in-creasing or maintaining the level of production in changed river systems are presented. These papers changed river systems are presented. These papers were presented at the symposium on Water, Man, and Nature, cosponsored by the Bureau of Reclamation and the American Institute of Biological Sciences at Colorado State University, Ft. Collins, Colo, August 30-31, 1971. (USBR) W72-12668

WATER RESOURCES DEVELOPMENT IN THE MULLICA RIVER BASIN, PART I, BIOLOGICAL EVALUATION OF THE MULLICA GREAT BAY ESTUARY, Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst. For primary bibliographic entry see Field 02L. W72-12706

AGRICULTURE AS AN ENVIRONMENTAL FACTOR, Norges Veterinarhoegskole, Oslo. Dept. of Norges Veterinarhoegskole, Oslo. Dept. Microbiology and Immunology. For primary bibliographic entry see Field 05B.

Field 07 - RESOURCES DATA

Group 7B - Data Acquisition

07. RESOURCES DATA

7B. Data Acquisition

TENNESSEE WATER QUALITY, SURFACE STREAMS. Tennessee Water Quality Control Board, Nash-For primary bibliographic entry see Field 05A.

PROBLEMS OF EVAPORATION ASSESSMENT IN THE WATER BALANCE, For primary bibliographic entry see Field 02D. W72-12415

DIRECT METHODS OF SOIL MOISTURE ESTI-MATION FOR WATER BALANCE PURPOSES, For primary bibliographic entry see Field 02G. W72-12417

SALINITY CALCULATIONS FROM IN SITU MEASUREMENTS, Department of the Environment, Victoria (British

Columbia). Marine Sciences Branch (Pacific Re-(ani For primary bibliographic entry see Field 02L.

W72-12427

A PLEISTOCENE SUSQUEHANNA RIVER CHANNEL CONNECTS THE LOWER REACHES OF THE CHESTER, MILES, AND CHOPTANK ESTUARIES, Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.

For primary bibliographic entry see Field 02L. W72-12428

INFILTRATION ANALYSIS II-SPRINKLIN-G-PLOT ANALYSIS, Ministry of Works, Wellington (New Zealand). For primary bibliographic entry see Field 02G. W72-12431

A METHOD FOR FORECASTING ANNUAL IN-FLOW OF WATER TO LAKE SEVAN (METOD PROGNOZA GODOVOGO PRITOKA VOD V OZERO SEVAN), Zakavkazskii Nauchno-Issledovatelskii

Gidrometeorologicheskii Institut, Tiflis (USSR). For primary bibliographic entry see Field 02E. W72-12439

MULTIDIRECTIONAL TURBULENCE PROBE DEVELOPMENT PHASE I - UNIDIRECTIONAL TURBULENCE SENSOR DEVELOPMENT. Battelle Columbus Labs., Ohio. For primary bibliographic entry see Field 02E. W72-12453

COMPARISON OF THERMAL DATA FROM AIRBORNE AND VESSEL SURVEYS OF LAKE ERIE, Wisconsin Univ., Milwaukee. Center for Great

Lakes Studies. For primary bibliographic entry see Field 05A. W72-12455

SATELLITE MEASUREMENT OF LAKE-SU-RFACE TEMPERATURES,

Allied Research Associates, Inc., Concord, Mass. For primary bibliographic entry see Field 02H. W72-12460

COLOR INFRARED (CIR) PHOTOGRAPHY: A TOOL FOR ENVIRONMENTAL ANALYSIS,
Dartmouth Coll., Hanover, N.H., Dept. of Geography. For primary bibliographic entry see Field 05A. W72-12487

LIGHT-SCATTERING PROFILES IN THE STRAITS OF FLORIDA, Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.; and Miami Univ., Coral Ga-bles, Fla. Optical Physics Lab. For primary bibliographic entry see Field 05B. W72-12488

THE INVERSE AUTOCORRELATIONS OF A TIME SERIES AND THEIR APPLICATIONS, North Carolina Univ., Chapel Hill. Dept. of Statistics. W. S. Cleveland.

Technometrics, Vol 14, No 2, p 277-293, May 1972. 11 tab. 12 ref.

Descriptors: *Correlation analysis, *Time series analysis, *Statistical methods, Mathematical studies, Equations, Quality control, Statistical models, Fourier analysis, Variability, Estimating. Identifiers: *Time series, *Autocorrelations, Autoregression, Chemical concentration.

Autocorrelations of a time series were defined to be those which are associated with the inverse of the spectral density of a series and were calculated as the autocorrelations associated with the inverse of the spectral density estimate. Estimating inverse autocorrelations differed depending on whether autoregressive or periodogram smoothing methods of estimating the spectral density were used. The estimates of the inverse autocorrelations are used to assist in identifying a parsimonious, moving-average, autoregressive model for the series and to provide rough initial estimates of the parameters for an iterative search for the maximum of the likelihood function. The techniques of using inverse autocorrelations of a series are applicable to chemical process concentration readings. (Long-Battelle) W72-12499

A SHORT LIFE TEST FOR COMPARING A SAMPLE WITH PREVIOUS ACCELERATED TEST RESULTS, General Electric Co., Schenectady, N.Y. Research

and Development Center. W. Nelson.

Technometrics, Vol 14, No 1, p 175-185, February 1972. 2 fig, 1 tab, 8 ref.

Descriptors: *Regression analysis, methods, Evaluation, Distribution, Temperature, Reliability, Mathematical models, Probability, Testing, Sampling, Mathematical studies, Equations, Quality control, Statistical models, Operations research, Statistics.

Identifiers: *Accelerated testing, Arrhenius

A statistical test for equality of the logarithmic means of two lognormal life distributions is presented for the situation where information on the first distribution is obtained from a regression analysis of accelerated life test data obtained at various temperatures and the information on the second distribution is the time to the first failure in a sample tested at a particular temperature. The test is based on the Arrhenius model. (Long-Battelle) W72-12500

A DEVICE FOR REMOVING WATER OR MUD FROM SHALLOW WATER WELLS (USTROYSTVO DLYA UDALENIYA VODY ILI PUL'PY IZ NEGLUBOKIKH GRUNTOVYKH SKVAZHIN), For primary bibliographic entry see Field 04B. W72-12689

DETERMINATION OF THE WATER EQUIVALENT OF SNOW COVER-METHODS AND EQUIPMENT. Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W72-12697

PLANNING AND IMPLEMENTATION OF REMOTE SENSING EXPERIMENTS, Texas A and M Univ., College Station. Remote Sensing Center. For primary bibliographic entry see Field 05B. W72-12712

SELF-BALANCING BRIDGE FOR DIF-FERENTIAL CAPACITANCE MEASURE-Wayne State Univ., Detroit, Mich. Dept. of

Chemistry.
D. H. Chidester, and R. R. Schroeder.

Analytical Chemistry, Vol 44, No 6, p 985-992, May 1972. 13 fig. 1 tab, 10 ref.

Descriptors: *Measurement, *Bridges (Electric), Capacitors, *Electrolytes, *Adsorption, Mercury, Aqueous solutions, Reliability, Instrumentation, Equipment, Zeta potential. Identifiers: *Differential capacitance, Precision, Ion selective electrodes, Mercury electrode.

A description is given of a new, self-balancing capacitance bridge, which was designed and constructed utilizing electromechanical servo control of the capacitance multiplier for making differential capacitance measurements. Using a 60-Hz signal of less than 10 mV peak to peak, capacitance in the range of 0.25 to 2.0 mF were measured with a precision of plus or minus 1 per-cent. Differential capacitance measurements of mercury electrodes were made using aqueous solutions of several different electrolytes and were compared with data found in the literature. A study of the adsorption of camphor at a hanging mercury drop electrode was conducted to confirm the instrument's ability to function in systems with strongly adsorbed species. (Byrd-Battelle) W72-12716

PRECIPITATION SCAVENGING (1970). For primary bibliographic entry see Field 05B. W72-12752

SCAVENGING OF AEROSOL PARTICLES BY SPRAYS. Battelle-Pacific Northwest Labs., Richland, For primary bibliographic entry see Field 05B.

CONTINUOUS CHARGED CLOUD-PARTICLE SAMPLER, Manchester Univ. (England). Dept. of Physics.

For primary bibliographic entry see Field 05B. W72-12766

W72-12765

PULSED-LASER HOLOGRAPHY FOR ANALY-SIS OF PARTICLE SIZE AND DISTRIBUTION, Battelle-Pacific Northwest Labs., Richland, Wash For primary bibliographic entry see Field 05B. W72-12767

Evaluation, Processing and Publication—Group 7C

THERMAL-DIFFUSION CHAMBERS CLOUD-NUCLEI COUNTERS,
Missouri Univ., Rolla. Graduate Center for Cloud Physics Research. For primary bibliographic entry see Field 05B. W72-12768

AUTOMATIC SEQUENTIAL RAIN SAMPLER FOR SCAVENGING STUDIES, Argonne National Lab., Ill. Radiological Physics For primary bibliographic entry see Field 05B. W72-12769

WASHOUT OF GASEOUS IODINE SPECIES, Battelle-Pacific Northwest Labs., Richland, For primary bibliographic entry see Field 05B. W72-12772

SPEED CALIBRATION OF THE PLESSEY MODEL M021 SELF-RECORDING CURRENT Department of the Environment, Ottawa (Ontario). Inland Waters Branch. For primary bibliographic entry see Field 02E.

7C. Evaluation, Processing and Publication

A DIMENSIONLESS PARAMETER STUDY OF GROUNDWATER RECHARGE, PHASE II, Oklahoma Univ. Research Inst., Norman. For primary bibliographic entry see Field 04B.

A PROGRAM FOR ESTIMATING RUNOFF FROM INDIANA WATERSHEDS PART II. AS-SEMBLY OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA, Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 02A.
W72-12392

AVAILABILITY OF WATER IN KALAMAZOO COUNTY, SOUTHWESTERN MICHIGAN, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B.

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE HOUSTON, TEXAS METROPOLITAN

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 02E. W72-12430

WATER RESOURCES INVESTIGATIONS IN PUERTO RICO, AND VIRGIN ISLANDS, 1969. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 5 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Puerto Rico, *Virgin Islands, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Rainfall, Runoff, Streamflow, Sediment transport, On-site investigations, Water quality, Chemical analysis, Water level fluctuations, Bibliographies, Networks, Maps. Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Puerto Rico and the Virgia Islands are summarized. A selected bibliog-raphy is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 145 primary, hydrologic data network consists of 145 primary, secondary, and water management streamflow stations; 79 groundwater observation wells; and 75 water quality observing sites. Small State maps show principal sources of groundwater, annual average precipitation, average annual runoff, drainage areas developed for public water use, and representative chemical analysis of surface water. representative chemical analysis of surface water. A map, scale 10 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Puerto Rico and the Virgin Islands in August 1969. (Woodard-USGS) W72-12444

WATER RESOURCES INVESTIGATIONS IN MICHIGAN, 1968. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 8 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Michigan, *Inter-agency cooperation, Precipitation (Atmospheric), Runoff, Surveys, Glacial Aquifers, Planning, Hydrologic data, Basic data collections, Streamflow, Sediment transport, Onsite investigations, Water temperature, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.

Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Michigan are sum-marized. A selected bibliography of material con-cerning the State is included. A list is given of cerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 205 pri-mary, secondary and water management stream-flow stations; 335 groundeater observation wells; and 36 water quality observing sites. Small State and 36 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, and discharge of the principal rivers. A map, scale 43 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Michigan in October 1968. (Woodard-USGS)

WATER RESOURCES INVESTIGATIONS IN NEW YORK, 1968. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 5 fig, 1 map, 2 tab.

Descriptors: "Water resources, "Investigations, "New York, "Inter-agency cooperation, Precipitation (Atmospheric), Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Water temperature, On-site investigations, Water quali-ty, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps. Identifiers: *Cooperative water-studies program,

Research projects.

The water resources studies and investigations of the U.S. Geological Survey in New York are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 300 practices are appropriated by the program of mary, secondary and water management stream-flow stations; 70 groundwater observation wells; and 80 water quality observing sites. Small State maps show prinicpal sources of groundwater,

mean annual precipitation, average annual runoff, discharge of the principal rivers, and the dissolved solids in ground and surface waters. A map, scale 18 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in New York in July 1968. (Woodard-USGS)

WATER RESOURCES INVESTIGATIONS IN UTAH, 1968. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 5 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Utah, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Streamflow, Sedi-ment transport, On-site investigations, Water tem-perature, Water quality, Dissolved solids, Water level fluctuations, Great Salt Lake, Bibliogra-phies, Networks, Maps, Histograms. phies, Networks, Maps, Histograms. Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Utah are sum-marized. A selected bibliography of material con-cerning the State is included. A list is given of cerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 278 primary, secondary, and water management streamflow stations; 472 groundwater observation wells; and 118 water quality observing sites (29 on streams and 89 wells). Small State maps show principal sources of groundwater, mean annual precipitation, discharge of the principal rivers, water level fluctuations of Great Salt Lake, and the dissolved solids in ground and surface waters. A map, scale 50 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data numbers, and colored outline the hydrologic data network and investigations in Utah in September 1968. (Woodard-USGS) W72-12447

WATER RESOURCES INVESTIGATIONS IN VIRGINIA, 1969. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 4 fig, 1 map.

Descriptors: *Water resources, *Investigations, Descriptors: "Water resources, "Investigations, *Virginia, "Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmosphenic), Runoff, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Net-works, Maps. Identifiers: "Cooperative water-supplies program, Research projects.

The water resources studies and investigations of the U.S. Geological Survey in Virginia are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 173 primary, secondary, and water management streamflow stations; 64 groundwater observation wells; and 21 water quality observing sites. Small State maps show principal sources of groundwater, discharge of the principal rivers, average annual reposition, and average annual runoff. A map, scale 32 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Virginia in July 1969. (Woodard-USGS)

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Field 07—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

TIME SERIES ANALYSIS OF WATER POLLU-TION DATA, Virginia Polytechnic Inst. and State Univ., Blacksburg. For primary bibliographic entry see Field 05A.

THE ANNUAL WATER STATEMENT, 1971--1972, High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
For primary bibliographic entry see Field 04B.

EXTENSION OF OCEANOGRAPHIC STUDIES IN PUGET SOUND AND THE NORTHEAST PACIFIC OCEAN, Washington Univ., Seattle. Dept. of Oceanog-

For primary bibliographic entry see Field 02L. W72-12639

COMPUTER SIMULATION OF FRACTURING OF LAYERED ROCK, Nagoya Univ. (Japan). For primary bibliographic entry see Field 08E.

WATER RESOURCES INVESTIGATIONS IN WYOMING, 1968. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Wyoming, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Streamflow. Sediment transport, On-site investigations, Water temperature, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Net-works, Maps.

Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Wyoming are summarized. A selected bibliography of material con-cerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 216 primary, secondary, and water management streamflow stations; 238 groundwater observation wells; and 91 water quality observing sites. Small State maps show principal sources of groundwater, mean annual precipitation, average annual runoff, sediment concentration of rivers, discharge of the principal rivers, and the dissolved solids in major streams. A map, scale 42 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Wyoming in December 1968. (Woodard-USGS) W72-12698

CURRENT TRENDS GEOMORPHOLOGY, Wisconsin Univ., Madison. Dept. of Geography and Geology. For primary bibliographic entry see Field 02J.

FLOODS FROM SMALL DRAINAGE AREAS IN CALIFORNIA--A COMPILATION OF PEAK DATA, OCTOBER 1958 TO SEPTEMBER 1971, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02E. W72-12703

BASIC DATA FOR CHEMICAL WASTE DISPOSAL, Du Pont de Nemours (E. I.) and Co., Wilmington,

Del. Engineering Dept.
For primary bibliographic entry see Field 05G. W72-12803

WATER RESOURCES DATA FOR NEW YORK, 1970: PART 2. WATER QUALITY RECORDS. Geological Survey, Albany, N.Y.

Geological Survey Data Reports, 1972. 256 p, 10 fig. 5 tab, 22 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Basic data collections, *New York, Sampling, Sediment transport, Rain water, Water analysis, Chemical analysis, Water chemistry, Water temperature.

Water resources data for the 1970 water year for the State of New York include records of data for the chemical and physical characteristics of surface water and groundwater. Also chemical quality race water and groundwater. Also chemical quantity of precipitation data are reported for 8 stations in New York and for one station just over the border in Pennsylvania. Water-quality information is presented for chemical quality, microbiological content, water temperature, and fluvial sediment. Chamical quality includes concentrations of in-Chemical quality includes concentrations of in-dividually dissolved constituents and certain properties or characteristics such as hardness of water, specific conductance, and pH. Microbiological information includes quantitative identification of certain bacteriological indicator organisms. The data include a description of the sampling station and tabulations of the samples analyzed. The description of the sampling station gives location, drainage area, periods of record for the various water-quality data, extremes of the pertinent data, and general remarks. (Woodard-USGS) W72-12862

STREAMFLOW VARIATION AND DISTRIBUTION IN THE BIG CYPRESS WATERSHED DURING WET AND DRY PERIODS, Geological Survey, Tallahassee, Fla.

H. J. Freiberger. Florida Bureau of Geology Map Series No 45, 1972. 1 sheet, 8 fig, 1 ref.

Descriptors: *Streamflow, *Discharge measurement, *High flow, *Low flow, *Florida, Watersheds (Basins), Stream gages, Rainfall-runoff relationships, Hydrologic data, Maps, Curves, Overland flow, Canals.

Identifiers: *Big Cypress Watershed (Fla), *Everglades National Park (Fla).

A part of the water needs of Everglades National Park and the Lower Gulf Coast communities is fulfilled by water that drains from the Big Cypress Watershed. This map report shows the mag-nitudes, direction, and distribution of surface-water flows through the watershed during periods of high and low flows. The Big Cypress Watershed in southwestern Florida encompasses an area of about 2,450 square miles, most of which lies in Collier County. Streamflow throughout the Watershed was determined from discharge meawatersned was determined from discharge mea-surements made at about 250 sites during November 18-20, 1969, in a period of high flow. Dur-ing November 18-20, 1969, the total flow through the outlets along Everglades Parkway between the Levee 28 Interceptor Canal and Naples was 1,603 cfs. This flow was distributed through canals and overland. On March 9, 1971, the flow through Everglades Parkway between the same two points was 40 cfs. There was no overland sheet flow through the outlets along this 50-mile stretch of Everglades Parkway. The flow was divided between just two canals, 29 cfs in Barron River Canal and 11 cfs in the Turner River Canal. (Woodard-USGS)

W72-12869

SELECTED WATER-QUALITY RECORDS FOR TEXAS SURFACE WATERS, 1970 WATER

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 05A.

WATER RESOURCES INVESTIGATIONS IN WISCONSIN, 1968. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1968. 6 fig, 1 map.

Descriptors: *Water resources, *Investigations, *Wisconsin, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Runoff, Streamflow, Sediment transport, On-site investigations, Water temperature, Water quality, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.

Identifiers: *Cooperative water-studies program, Research projects.

The water resources studies and investigations of the U. S. Geological Survey in Wisconsin are summarized. A selected bibliography of material con-cerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 102 primary, secondary, and water management stream-flow stations; 205 groundwater observation wells; 18 spring flow observation sites; and 40 water quality observing sites. Small State maps show principal sources of groundwater, average annual precipitation, average annual runoff, discharge of the principal rivers, and the quality of ground and surface waters. A map, scale 44 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Wisconsin in August 1968. (Woodard-USGS) W72-12874

WATER RESOURCES INVESTIGATION IN VERMONT, 1968. Geological Survey, Washington, D.C.

Geological Survey Report of Investigations Folder, 1 sheet, 1969. 3 fig, 1 map.

Descriptors: *Water resources, *Investigations, Vermont, *Inter-agency cooperation, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation (Atmospheric), Streamflow, Runoff, Sediment transport, On-site investigations, Water quality, Water level fluctuations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program,

Research Projects.

The water resources studies and investigations of the U. S. Geological Survey in Vermont are summarized. A selected bibliography of material concerning the State is included. A list is given of State and Federal agencies, counties, and cities who cooperate in different parts of the program. The hydrologic data network consists of 53 primary, secondary, and water management streamflow stations; 14 groundwater observation wells; and 8 water quality observing sites. Small State maps show mean annual precipitation, average annual runoff, and discharge of the principal rivers. A map, scale 20 mi to the inch, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Vermont in December 1968. (Woodard-USGS) W72-12875

08. ENGINEERING WORKS

8A. Structures

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SEWER BEDDING AND INFILTRATION, GULF

SEWER BEDDING AND INFILTRATION, GULF COAST AREA, Tulane Univ., New Orleans, La. J. K. Mayer, F. W. Macdonald, and S. E. Steimle. Copy available from GPO Sup Doc EPA 11022 DEI,05/71, \$1.50; microfiche from NTIS as PB-211 282, \$0.95. Environmental Protection Agency, Water Pollution Control Research Series, May 1972. 183 p, 48 fig, 33 tab, 21 ref. EPA Program 11022 DEI 05/72. 80-04-68.

Descriptors: *Infiltration rates, *Sanitary engineering, *Sewerage, *Backfill, *Infiltration, *Leakage, Manholes, Sewers, Louisiana, Construction joints, Joints (Connections), Trenches, Pipelines.

Identifiers: *New Orleans (Louisiana), Sewer infiltration, Sewer bedding, Sewer construction, Bedding material, Construction practices.

Groundwater infiltration studies were performed on several sewer systems in 1962-63 and again in 1970 and the results were compared. Infiltration measurements in the systems ranged from zero to 111,560 gallons per inch of diameter per mile per day. The infiltration was slightly increased in some lines and was greatly decreased in others. The decrease is attributed to soil and grease clogging the breaks, as was observed in subsequent televi-sion inspection. Infiltration has been found to vary with time. The high infiltration rates were attributed to poor construction methods used by contractors on the main sewer system and by plumbers on house connections. A survey of 1,600 manholes showed 3.5 percent to have infiltration at the time of the inspection and others likely to develop infiltration during periods of heavy rain-falls. Bedding and backfill material should provide even distribution of load and support for the pipe.
A second function of this material should be to impede the flow of water surrounding the sewer when the pipe is laid below the water table. The material should completely surround the pipe. (Poertner) W72-12394

THE RESPONSE OF AN INTAKE TOWER AT HOOVER DAM TO EARTHQUAKES, Bureau of Reclamation, Denver, Colo.

C. W. Cozart. Bureau of Reclamation Report REC-ERC-71-50, Dec 1971. 16 p, 11 fig, 1 photo, 4 tab, 18 ref.

Descriptors: *Earthquakes, *Seismic design, *Acceleration (Physics), Seismic studies, Measuring instruments, Dam design, Structural engineering, Structural behavior, Dynamics, Seismographs, Bibliographies, Digital computers, Structural anal-

ysis, Computer models, Arizona.
Identifiers: *Intake towers, Damping, Earth
movements, Dynamic methods, Hoover Dam, Mode, Dynamic response.

Records of earthquakes from seismographs at Hoover Dam enabled comparisons of time dependent accelerations measured near the top of one of the intake towers with accelerations computed by a lumped mass, generalized coordinate method. One of the seismographs is located in the downstream Nevada Intake Tower at elevation 1227. Another is in a switchyard oil house about 1/3 mi from the intake structure. The intake tower, approximately 338 ft high (excluding a hoist house on top), is comprised of an inner barrel, approximately 30 ft inside diameter, surrounded by 12 equally spaced tapered fins. The outside diameter at the base is 82 ft. The mathematical model used 12 lumped masses. Included in the model was the

effect of the water around the tower. Analyses effect of the water around the tower. Analyses were by computer, using digitized accelerograph records for input. Output was an acceleration vs time graph of the top lumped mass of the tower. Graphs for 3 earthquakes and 2 values of damping are included. The study showed that: (1) 12 lumped masses were sufficient to compute accurately the frequencies and shapes of the first 4 modes; (2) viscous damping factors of 0.02 to 0.03 appear to be in the correct range; and (3) satisfactory comparisons of computed and measured accelerations can be made. (USBR)

STUDY OF CONSTRUCTION METHODS FOR LARGE UNDERSEA CONCRETE STRUC-

Santa Fe-Pomeroy, Inc., San Francisco, Calif. Engineering Div. For primary bibliographic entry see Field 08F. W72-12702

8B. Hydraulics

HYDRAULIC TESTING OF HOLE UA-1-HTH-1, AMCHITKA ISLAND, ALASKA, Geological Survey, Denver, Colo. W. C. Ballance, and G. A. Dinwiddie.

Available from the National Technical Informa tion Service, \$3.00 in paper copy, \$0.95 in microfiche. Geological Survey Report USGS-474-144 (Amchitka-32), May 1972. 27 p, 6 fig, 4 tab, 1 ref. AEC AT (29-2)-474.

Descriptors: *Boreholes, *Hydraulics, *Hydraulic properties, *Alaska, Testing, Pressure head, Depth, Water analysis, Chemical analysis, Dating, Deptin, water analysis, Chemical analysis, Dating, Geologic time, Pumping, Groundwater, Water yield, Drawdown, Natural recharge, Hydrologic data, Data collections, Methodology, Hydraulic conductivity, Transmisvity, Identifiers: *Amchitka Island (Alaska), C-14.

Hole UA-1-HTH-1 on Amchitka Island, Alaska, was drilled and hydraulically tested in July and August 1971. The elevation of land surface at the site is 50.13 meters above mean sea level. Total depth of the hole was 1,054 m but, because of borehole erosion and bridging, only about 198 m of the hole was hydraulically tested with straddle packers. Some information was obtained on the lower part of the hole by use of the pressure recorders. The heads below land surface tested with straddle packers ranged from 3.9 m in the interval 80.5 to 125.0 m to 5.7 in the interval 227.4 to 278.6 m. The composite static water level following a pumping test was 5.5 m. The composite head below 278.6 m, determined from a pressure recorder, was about 12.2 m. The head distribution recorder, was about 12.2 m. The head distribution indicates a decreasing head with depth. Water samples were collected from two intervals for chemical, radiochemical, and C-14 analysis. The unadjusted age of water in the interval 183.5 to 234.7 m was 8,410 years, and 17,800 years for the interval 227.4 to 278.6 m. (Woodard-USGS) W72-12421

KANSAS STREAMFLOW CHARACTERISTICS. PART 9, MEAN ANNUAL RUNOFF AS RE-LATED TO CHANNEL GEOMETRY OF SELECTED STREAMS IN KANSAS, Kansas State Geological Survey, Lawren

For primary bibliographic entry see Field 02E. W72-12423

ON THE BEDDING IN THE NATURAL-LEVEE AND THE POINT-BAR DEPOSITS OF THE GOMTI RIVER, UTTAR PRADESH, INDIA, Lucknow Univ. (India). Dept. of Geology. For primary bibliographic entry see Field 02J. W72-12424

SEDIMENT TRANSPORT CAUSED BY WAVE MOVEMENT (TRANSPORT NANOSOV VOL-

MOVEMENT (TRANSPORT NANOSOV VOL-NAMI),
Zakavkazskii Nauchno-Issledovatelskii
Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02E.
W72-12435

STUDIES IN DENSITY STRATIFIED FLOWS, New South Wales Univ., Kensington (Australia). School of Civil Engineering.

School Civil Engineering.

D. L. Wilkinson.

New South Wales University Water Research
Laboratory Report No 118, April 1970. 167 p, 75

fig, 37 ref, 10 append.

Descriptors: *Stratified flow, *Density stratifica-tion, *Supercritical flow, *Subcritical flow, *Forecasting, Mathematical studies, Analytical techniques, Equations, Velocity, Hydraulic jump, Flow profiles, Streamflow, Model studies, Boun-daries (Surfaces), Boundary layers. Identifiers: Deasity jump, Rapidly varied flow.

The rapidly varied flow phenomenon in a density stratified system is examined where only one layer flows and the other is stationary. The flow regime changes from supercritical to subcritical across the region of rapidly varied flow. The analogous phenomenon in open channel hydraulics is the hydraulic jump. In stratified flows it is referred to as a density jump because it is generally accompanied by a change in the density of the flowing layer. An entrainment function is derived, relating a local entrainment parameter to a local Froude a local entrainment parameter to a local Froude number within the entraining zone of a density jump. Some features of unsteady density flows are examined showing that the properties of starting flow or nose are controlled by the following layer, which in turn, is generally controlled by boundary which in turn, is generally controlled by boundary friction. Conditions downstream of density jump can be predicted for power station cooling pond outfalls and some ocean-sewage outfalls. A design example is included showing how power station cooling pond efficiencies can be optimized by the control of mixing at the outfall. (Woodard-USGS) W72-12449

HEATED SURFACE JET DISCHARGED INTO A

HEATED SURFACE JET DISCHARGED INTO A FLOWING AMBIENT STREAM, National Center for Research and Training in the Hydrologic and Hydraulic Aspects of Water Pollution Control, Nashville, Tenn.

For primary bibliographic entry see Field 05B. W72-12451

HYDRAULIC MODEL STUDIES OF THE FOREBAY RESERVOIR INLET-OUTLET STRUCTURE FOR MT. ELBERT PUMPED-STORAGE POWERPLANT, FRYINGPAN-A-RKANSAS PROJECT, COLORADO,

Bureau of Reclamation, Denver, Colo P. L. Johnson. Bureau of Reclamation Report REC-ERC-72-5, Jan 1972. 16 p, 16 fig.

Descriptors: *Pumped storage, *Outlets, *Vortices, *Model studies, Hydraulic models, Flow characteristics, Flow distribution, Head loss, Trash racks, Model tests, Water surface, Inlets (Waterways), Hydraulic structures, Deflectors, Penstocks, Forebays, *Colorado.

Identifiers: *Intake transitions, *Velocity distribution, *Exclusivemen.Actions of Colorado. tion, *Fryingpan-Arkansas Project, Colo

Hydraulic model studies at a 1:23.23 scale were Hydraulic model studies at a 1:23:23 scale were performed to assure satisfactory flow conditions through the forebay reservoir inlet-outlet structure for Mt. Elbert Pumped-Storage Powerplant in Colo. The main purpose for the studies was to develop a design to provide a uniform velocity distribution at the trashracks during the pumped cycle. Uniform velocity distribution would minimize the possibility of forming strong vortex shedding and reduce the forces causing trashrack fatigue

Field 08—ENGINEERING WORKS

Group 8B—Hydraulics

failure. Flow conditions for the generating cycle were evaluated to ensure a uniform velocity distribution free of air entraining surface vortices. Head loss measurements were made for the inletoutlet structure and a portion of the penstocks. A horizontal deflector with flip blocks was developed to improve the vertical velocity distribution at the trashrack position. A flat upward sloping floor was developed to replace the original concave floor in the structure. Both a raft-type structure and a lattice-like wall structure were developed to suppress generation of surface vortices. Neither structure eliminated the vortices, but did eliminate air intake into the penstocks.
(USBR)

LABORATORY STUDY OF A FLAT-BOTTOM TRAPEZOIDAL VENTURI FLUME, Bureau of Reclamation, Denver, Colo.

R. A. Dodge. Bureau of Reclamation Report REC-ERC-72-14, April 1972. 10 p., 10 fig, 4 ref.

Descriptors: *Discharge measurement, *Venturi flumes, Hydraulics, Water measurement, Calibrations, Head loss, Energy loss, Laboratory tests, Boundaries (Surfaces), Roughness (Hydraulic). Identifiers: *Trapezoidal flumes, Test results, Model tests.

One flat-bottom trapezoidal venturi flume was studied in the laboratory as part of the Bureau of Reclamation Water Measurement Program. The flume has side slope angles of 45 deg. The angles of convergence of the inlet transition and divergence of the outlet transition were 5 deg. The inlet transition throat and outlet transition were 3 ft long. The throat bottom width was 4 in. The measuring station was one-half ft upstream from the start of the convergence. The flume was calibrated for a painted wood surface and a sand-coated surface. The discharge range was 0.5 to 5.0 cfs. The measuring head for the sand roughened flume was 2% higher at 0.5 cfs and 1% higher at 5.0 cfs than for the painted wood flume. Errors in discharge from 2-1/2 to 4-1/2% occur when friction is neglected in computing the discharge from equations developed for the painted wood flume. Energy losses for the flat-bottom trapezoidal venturi flume are from 30 to 50% of the losses for the 1-ft Parshall flume which has about the same discharge range. Backwater computations can be used to calculate measuring head elevation. However, prior knowledge of friction and eddy loss factors is required. Relative roughness effects should be accounted for in the low discharge range. (USBR) W72-12667

EXPERIMENTAL STUDIES OF THE REFRAC-TION OF UNIFORM WAVE TRAINS AND TRANSIENT WAVE GROUPS NEAR STRAIGHT CAUSTIC.

New York Univ., Bronx. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 02E.

A NEW MATHEMATICAL MODEL FOR THE VELOCITY DISTRIBUTION IN TURBULENT

SHEAR FLOW,
Agricultural Research Service, Oxford, Miss.
Sedimentation Lab. For primary bibliographic entry see Field 02E.

W72-12872

BED-LOAD SEDIMENTS,

Australian National Univ., Canberra, Dept. of For primary bibliographic entry see Field 02J. W72-12877

A REVIEW OF CONCEPTUAL MODELS AND PREDICTION EQUATIONS FOR REAERATION
IN OPNE-CHANNEL FLOW,

Department of the Environment, Ottawa (On-tario). Inland Waters Branch.
For primary bibliographic entry see Field 05G.

8C. Hydraulic Machinery

PUMPED-STORAGE POTENTIAL OF THE PACIFIC NORTHWEST, PARTS I, II, AND SUMMARY REPORT. Corps of Engineers, Portland, Oreg. North Pacific

For primary bibliographic entry see Field 03E.

W72-12450

ADVANCED NONTHERMALLY POLLUTING GAS TURBINES IN UTILITY APPLICATIONS.
United Aircraft Research Labs., East Hartford, For primary bibliographic entry see Field 05B.

SPOKANE RIVER PROJECT (DRAFT EN-VIRONMENTAL STATEMENT). Federal Power Commission, Washington, D.C.

Available from the National Technical Informa-tion Service as PB-207 913-D, \$3.00 in paper, \$0.95 in microfiche. March 31, 1972. 116 p, 2 map, 2 il-lus, 6 photo, 6 dwg.

Descriptors: *Washington, *Environmental effects, *Project planning, *Permits, *Electric power, Dams, Powerplants, Water pollution control, Water resources development, Alternate planning, Administrative agencies, Coordination, Decision making, Construction, Comprehensive planning, Federal government. Identifiers: *Environmental Impact Statements, *Spokane (Wash).

The action consists of licensing for continued operation four Washington developments, each having a dam, powerhouse, and pertinent facilities. No adverse environmental effects are expected to occur with the continued operation of the project. Pollution abatement action programs are in progress. Reconstruction of the Monroe Street plant will cause minor adverse environmen-Street plant win cause minor adverse environment tal effects, including noise, dust, and other forms of air pollution, which cannot be prevented but may be mitigated. The continued operation of the project is essential to the production of electric power in the Northwest and will provide for in-creased public benefits in outdoor, scenic, and recreational opportunities. Alternatives include licensing as is, denial, and licensing under conditions. Alternatives to reconstruction of the Monroe Street plant are to replace project works as needed, remove all project works, or modify the plan of reconstruction. Attached are a staff description of the application amendment, notice of application, agency review and applicant correspondence, applicant's proposal to reconstruct the Monroe Street plant, applicant's environmen-tal statement, and applicant's recreation plan. (Widman-Florida) W72-12603

ATLANTIC CITY ELECTRIC COMPANY, B. L. ENGLAND STATION--UNIT NO. 3, BEESLEY'S POINT, CAPE MAY COUNTY, NEW JERSEY, GREAT EGG HARBOR BAY (DRAFT ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Philadelphia, Pa.

Available from the National Technical Informa-tion Service as PB-205 671D, \$3.00 in paper copy, \$0.95 in microfiche. November 19, 1971. 23 p, 1

Descriptors: *Dredging, *Environmental effects, *New Jersey, *Electric powerplants, Water pollution sources, Air pollution, Effluents, Waste water disposal, Channels, Engineering, Environmental engineering, Design data, Design criteria, Aesthetics, Oil spills, Construction, Cooling water, Conveyance structures, Condits.

Identifiers: *Environmental Impact Statements, *Cape May County, N. J. Cape May County, N.J.

The proposed project involves the expansion of the B. L. England Generating Station located on the Great Egg Harbor Bay at Beesley's Point, Cape May County, New Jersey. Expansion involves the addition of one 160,000 kw oil-fired steam electric generating unit. Additionally a cooling water intake channel must be dredged and constructed and a discharge pipe must be laid in Great Egg Harbor. Fuel delivery will be accomplished by rail so as to lessen the chance of an oil spill. The probable environmental impacts of the project include some water quality and air quality impairment, increased noise from the powerplant construction, and some aesthetic impairment in the struction, and some aesthetic impairment in the project area. Adverse impacts include some air water quality impairment from the disch of effluents, however the effluent discharges comply with federal and state standards. Through equipment malfunction and abnormal waste discharges extensive pollution is possible; however, proper engineering design and operating procedures will minimize this possibility. Alternatives considered include: alternate sites, including those outside the system; alternate fuels, methods of delivery, type of boiler, and other project equipment; individual waste treatment of miscellaneous plant water uses; and no construction. (Grant-Florida) W72-12628

THE SNOWY MOUNTAINS HYDROELECTRIC AND IRRIGATION SCHEME (AUSTRALIA), For primary bibliographic entry see Field 04A. W72-12824

8D. Soil Mechanics

SEISMIC TECHNIQUES FOR DYNAMIC TEST-ING AND ENGINEERING SEABED SEDIMENTS, STUDIES

SEABLE SELVINETALS, Illinois Univ., Chicago. P. H. Feldhausen, and M. L. Silver. Underwater Journal Information Bulletin, Vol 3, No 6, p 263-279, Dec 1971. 19 fig, 2 tab, 60 ref.

Descriptors: *Seismic studies, *Foundation investigations, Dynamic tests, Soil mechanics, Bibliographies, Geophysics, Soil properties, Sediment deposits, Borehole geophsics, Geologic investigations, Soil tests, Lake sediments, Shear waves, Marine clays.

Identifiers: *Seismic tests, *Underwater foundations of the section of the second section of the second section of the second second section of the section of the second section of the

tion, Modulus of elasticity, Ocean bottom, Underwater structures, Resonance frequency method, Pulse method, Seismic reflection, Undersea aqueduct (Collective).

Seismic soil testing in the laboratory and the field enables underwater specialists to determine the engineering properties of soils subjected to dynamic loads from winds, waves, machinery, and earthquakes. These techniques provide more information than seismic reflection profiling because wave speeds in marine sediments are measured directly. The wave speeds are related to engineering properties, such as stress-strain behavior and energy attenuation in a vibrating soil-structure system. Laboratory methods discussed include pulse methods and resonant frequency testing. New and proposed in situ marine testing methods, including borehole shooting and surface wave tests, are described. Case histories of dynamic testing programs showed that many research marine site investigation techniques may soon be used routinely. (USBR)

SOIL-CEMENT SLOPE PROTECTION ON BU-REAU OF RECLAMATION FEATURES, Bureau of Reclamation, Denver, Colo. G. DeGroot.

Bureau of Reclamation Report REC-ERC-71-20, May 1971. 100 p. 51 fig. 3 tab. 74 chart, 17 ref. ap-

Descriptors: *Soil cement, *Slope protection, Perceiptors. Son Centent, Stope protection, Ferosion control, *Earth dam, Dam construction, Durability, Sands, Gradation, Soil compaction, Freeze-thaw tests, Mixing, Compaction equipment, Construction, Embankments, Bibliogramont, Construction, Constructi phies, Soil investigations, Construction equipment, Tests.

Identifiers: Merritt Dam (Nebr), Cheney Dam (Kans), Lubbock Regulating Reservoir (Tex), Glen Elder Dam (Kans), Starvation Dam (Utah), Wetting and drying tests, Performance tests, Records, Construction control.

A summary of Bureau of Reclamation experience with soil-cement slope protection is presented. Compacted soil-cement has been used as a riprap substitute on 7 major Bureau structures. Areas discussed include: preconstruction testing, construction equipment and procedures, construction control testingfor soil-cement, and performance of soil-cement facings. Successful performance of a soil-cement test section at Bonny Reservoir in eastern Colorado was used as the basis for design of the facings; durability and compressive strength test results limits established from the test section generally have been followed. Most soils used by the Bureau have been fine, silty sands; a summary of test results is presented. The soil-cement is mixed in a continuous flow mixing system, placed, and then compacted in nearly horizontal lifts with a combination of sheepsfoot and pneumatic rolling. Erosion of uncompacted material at the edge of the lifts results in a stairstep pattern of the slope. Durability tests on record cores taken at most features show low weight losses. Permost reatures show low weight losses. Performance of soil-cement facings in service has been generally satisfactory. More than normal breakage has occurred at a few locations on Cheney Dam in Kansas. (USBR) W72-12665

8E. Rock Mechanics and Geology

PRELIMINARY GEOLOGIC INVESTIGATIONS OF ROCK TUNNEL SITES FOR FLOOD AND POLLUTION CONTROL IN THE GREATER CHICAGO AREA, Illinois State Geological Survey, Urbana.

For primary bibliographic entry see Field 05G. W72-12420

THE RESPONSE OF AN INTAKE TOWER AT HOOVER DAM TO EARTHQUAKES, Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 08A.

COMPUTER SIMULATION OF FRACTURING OF LAYERED ROCK, Nagoya Univ. (Japan). I. Hattori, and S. Mizutani.

Engineering Geology International Journal, Vol 5, No 4, p 253-269, Dec 1971. 13 fig, 16 ref.

Descriptors: *Fractures (Geologic), *Simulation, *Failures, Computer models, *Rock mechanics, Stratification, Mathematical models, Stress con centration, Faults (Geologic), Griffith theory, Bibliographies, Stochastic processes, Anisotropy, Shear strength, Cracks, Rocks. Identifiers: *Crack propagation, *Failure surfaces, Fabics, Japan, Rock breakage, Shear cracks, Shear failure. The influence of layers upon the fracturing character of rock can be simulated by computer. Fracturing in a homogeneous material generally occurs on a flat plane, but fracturing in rock often is on an irregular surface. To simulate rock fracturing, a random walk model was devised consisting of a square 2-dimensional grid system of 101 by ing of a square 2-dimensional grid system of 101 by 101 grid cells. The rock strength in each grid cell was assigned using random numbers with a Gaus-sian distribution function. Three types of rock models were used: isotropic, nonisotropic with a layered fabric, and nonisotropic without a layered fabric. For these models: (1) failure begins when the shearing stress in a part of the grid system in-creases to a certain value; (2) the shearing stress reaches a maximum on a plane inclined at 45 deg to the principal stress direction; and (3) very high stresses concentrate at the edges of a small crack. Model results showed that layers have a great inmodel results showed that layers have a great in-fluence on the fracture patterns produced. The ef-fect of the layered fabric becomes greater as the inclination of the layered anisotropy approaches 45 deg to the principal stress direction, and as the difference between the strength of the matrix and the layered material becomes greater. (USBR) W72-12666

8F. Concrete

PREDICTION OF POTENTIAL STRENGTH OF CONCRETE FROM THE RESULTS OF EARLY

TESTS, Material Research and Development, Inc., Raleigh, N.C., and West Virginia Dept. of Highways, Charleston. S. B. Hudson, and G. W. Steele. Highway Research Record, No 370, p 25-35, 1971.

8 fig, 2 tab, 3 ref, append.

Descriptors: *Quality control, Test specimens, *Concrete technology, *Nomographs, *Concrete control, *Compressive strength, Graphical analysis. Test procedures, *Concrete testing. Identifiers: Test results, Concrete properties, Mathematical analysis.

Three experiments investigated the practicality of Inree experiments investigated the phatcharty or using early tests of jobsite-made concrete cylin-ders for quality control. The experiments included concrete of 3 cement constants, 3 brands of ce-ment, and 4 methods of conditioning specimens prior to test. Test results, when statistically analyzed, indicated a definite linear relationship between the logarithm of concrete maturity in degree-hours and the relative compressive strength. When specimens were tested at spaced strength. When specimens were tested at spaced values of maturity, an equation capable of predicting the 28-day strength of concrete to within about 500 psi was derived. A nomograph expedited computations of predicted values. Some simulation was conducted on 8 sets of jobsite cylinders tested at 23 to 42 hours of age. The average difference between predicted 28-day strengths and routine 28-day test results was about 300 psi. Practical ap-plication of this method requires a definite early test procedure and equation constants experimen tally derived for commonly used concrete mix-tures. Predicted results from early tests on jobsite cylinders can then be used for quality control and for prompt warning of unacceptable concrete. (USBR) W72-12662

STUDY OF CONSTRUCTION METHODS FOR LARGE UNDERSEA CONCRETE STRUC-TURES.

Santa Fe-Pomeroy, Inc., San Francisco, Calif. Engineering Div.

Available from NTIS, Springfield, Va. 22151 as AD-732 794, \$3.00 in paper copy, \$0.95 in microfiche. Dept of Navy Civil Engineering Lab Report CR 72.002, September 1971. 94 p, 15 fig, 11 ref, 2 append. 62399-71-C-0015.

Descriptors: *Engineering structures, *Underwater, *Oceans, *Concrete structures, Methodology, Reviews, Prestressed Cast-in-place structures, Reinforced concrete, Hydraulic structures, Construction materials, esign. entifiers: *Underwater construction

Identifiers: "Underwater construction.

Each offshore site has a different set of geographical conditions that should be evaluated prior to designing and selecting a method for construction of a large undersea concrete structure. These variables are considered in water depths up to 1000 feet. Undersea structures fall into two main categories: An Atmosphere Dry Unit (ADU), and an Equal Pressure Unit (EPU). An ADU is a structure having its interior space pressurized to one atmosphere, and is subjected to an external hydrostatic pressure corresponding to its depth below the water surface. An EPU is a structure which is subject to the same external and internal pressure. The interior of the structure may be wet or dry, depending on its function. For EPU structure with dry interior, a water/fair interface control chamber would be provided through which personnel and materials may pass from one medium to the other. Three methods of construction include: (1) segmental and modular structures; (2) concrete mixed on surface and delivered to site on seabed; and (3) concrete mixed and poured in-situ, using locally on surface and newvered to sate on seasoes, and (3) concrete mixed and poured in-situ, using locally available materials. Modular construction, combined with grouting by direct line delivery method, is considered the most promising method. (Woodard-USGS) 72-12702

8G. Materials

IN BWR'S, CORROSION CONTROL IS NON-CHEMICAL,
General Electric Co., Schenectady, N.Y.
S. G. Sawochka, and W. L. Pearl.
Industrial Water Engineering, p 23-27, March
1971. 1 fig, 2 tab, 4 ref.

Descriptors: "Nuclear powerplants, "Corrosion control, Demineralization, Radioactivity, Temperature, Oxidation, "Water cooling, Condensers, Wastes.

Identifiers: *Boiling water reactors, Feedwater, Heater drains

Replacement of copper alloys with stainless steel for feedwater heater tubing has dramatically reduced the formation of corrosion products in the reduced the formation of corrosion products in the boiling water reactor's primary coolant. Non-reliance on chemical control avoids a possible radiolytic decomposition of these chemicals in the primary system, which could lead to significant radioactivity and corrosion problems. Contaminants in the condensate result from corrosion of nants in the condensate result from corrosion of steam and turbine piping, turbine components, extraction steam piping, and feedwater heater shell, tubing, and drain lines. The presence of 60 ppb oxygen in a neutral pH feedwater system forms a protective layer on steel that substantially decreases iron corrosion products transported by the feedwater. Above 300 F, 25 ppb oxygen was sufficient to form the protective oxide. Corrosion products entering the primary coolant with the feedwater have a limited life, on the order of I minute, because of differences in the chemistries of the two waters. Corrosion product concentration in the primary coolant was approximately an order of magnitude less when Monel and coppernickel tubed feedwater heaters were refitted with stainless steel. (Upadhyaya-Vanderbilt) W72-12459

PWR WATER: VARYING CHEMISTRY AND 'HOT' CONTAMINANTS, Westinghouse Electric Corp., Pittsburgh, Pa. For primary bibliographic entry see Field 05D.

Field 08—ENGINEERING WORKS

Group 8G—Materials

SEISMIC TECHNIQUES FOR DYNAMIC TEST-ING AND ENGINEERING STUDIES OF SEABED SEDIMENTS,

Illinois Univ., Chicago.
For primary bibliographic entry see Field 08D.
W72-12660

8H. Rapid Excavation

RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED STREAMS AND PRECIPITATION COLLECTED IMMEDIATE-LY BEFORE AND AFTER THE SECOND PRODUCTION-TEST FLARING, PROJECT RU-

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 05A. W72-12422

8I. Fisheries Engineering

A SECOND LOOK AT UNITED STATES FISHE-

RIES MANAGEMENT, Miami Univ., Fla. School of Law For primary bibliographic entry see Field 06E.

THE SURVIVAL OF THE BAIKAL OMULEGGS (COREGONUS AUTUMNALIS MIGRATORIUS GEORGI) IN THE SPAWNING GROUNDS OF KICHERA RIVER AND THE EF-FECTS OF THE WATER LEVEL ON THE GENERATION SIZE,

GENERATION SIZE,
I. P. Shumilov.
Vopr Ikhtiol. Vol 11, No 2, p 280-289. 1971. Illus.
Identifiers: "Fish reproduction, "Fish eggs,
Coregonus autumnalis migratorius, Invertebrates,
*Kichera River, Size, Spawning, Survival, USSR.

Studies were conducted on the factors which af-fect the survival rate of C. autumnalis migratorius eggs in the spawning grounds of the Kichera River and, consequently, the size of the subsequent generations. Evaluation of the results showed that survival rate of the eggs in the spawning areas that were studied was 46.4%. The breakdown of the losses was as follows: eaten by invertebrates-28.6%, eaten by other fish-6.9%, and carried off by water current from the spawning grounds-2.1%. In order to increase the population of omuls it was recommended that reproduction be conducted under controlled conditions where destruction of the eggs can be prevented.--Copyright 1972, Biological Abstracts, Inc.

PITUITARY INJECTIONS IN THE REARING OF GRASS AND SILVER CARPS,

Moscow State Univ. (USSR). A. P. Makeeva, and B. V. Verigin. Vopr Ikhtiol. Vol 11, No 2, p 217-231. 1971. Illus. Identifiers: *Fish physiology, *Fish reproduction, Fish management, Aristichthys nobilis, *Carps, Ctenopharyngodon idella, Hypophthalmicthys molitray, Injections, Pituitary.

Studies were conducted from 1966 to 1970 at the Akkurgan fishery in Uzbekistan to determine the Akkurgan Isshery in Uzbekistan to determine the optimal dosages of pituitary extract injections into grass carp (Hypophthalmichthys molitrix), silver carp (Ctenopharyngodon idella), and the golden carp (Aristichthys nobilis) for maturation of the females and development of eggs. Analysis of the results showed that the percentage of fish yielding eggs and their fertility increased with an increase in the dosage of the pituitary extract up to 5 mg/kg. However, the dosage should be individually adjusted to the weight of the female. Contrary to the findings of others, higher dosages of pituitary extracts did not have an adverse effect on the viability of the eggs. Delay in the collection of the eggs from the females sharply reduces the fertility of the eggs and their viability. In addition, the pituitary extracts also lead to more rapid maturation of the females. Thus, this factor should be taken into consideration in determining the appropriate time for the collection of the eggs.—Copyright 1972, Biological Abstracts, Inc. W72-12746

NET AVOIDANCE BEHAVIOR IN AMERICAN SHAD (ALOSA SAPIDISSIMA) AS OBSERVED BY ULTRASONIC TRACKING TECHNIQUES, McGill Univ., Montreal (Quebec). Dept. of Biolo-

gy. W. C. Leggett, and R. A. Jones. J Fish Res Bd Can, Vol 28, No 8, p 1167-1171,

Identifiers: *Fish behavior, *Nets, Alosa sapidis-sima, Avoidance, Shad, Tracking techniques, Ul-

During tracking of 13 adult A. sapidissima with ultrasonic transmitters in 49 approaches to commercial drift gillnets in the lower Connecticut River, only I shad was captured. Typically, shad moved to within 1-2 m of the net before sensing its presence, then turned and swam along the net, close to the mesh, to its end, where they turned and continued their upriver migration. Sight ap-peared to play an important role in net detection. However, 14 avoidances were observed when light intensities were inadequate to allow visual detecses, perhaps the lateral line, also function in net avoidance, especially when sight is impaired.--Copyright 1972, Biological Abstracts, Inc. W72-12889 tion of the mesh. It was concluded that other sen-

DEVELOPING EFFICIENT METHODS FOR FEEDING CARP GROWN JOINTLY WITH PHYTOPHAGIC FISHES, (IN RUSSIAN),

Y. V. Moskalev. Sb Nauchno-Tekh Inf Krasnodar Fil Vses Nauchno-Issled Inst Prud Rybn Khoz. 1. p 62-65.

Identifiers: *Carps, *Feeding, Fish hatcheries, Phytophagic fish.

The experiments were carried out in ponds with an area of 0.1-0.2 ha at the Sinyukha Fish Farm at a sowing density of 4700 carp/ha and a ratio of bighead to carp of 1:1 or 0.5:1. Grass carp were planted as a melioration agent. Observations were made of a general reduction in the growth rate of the carp, except that the rate increased until the middle of July. During the 2nd half of the season growth rate could be improved by the application of 2 metric centers/ha of lime and the addition to the feed of phosphate salts and a fat-soluble polyvitamin concentrate. By this method, the carp grew 20% faster than controls.—Copyright 1972, Biological Abstracts, Inc. W72-13034

THE DEVELOPMENT OF BIOLOGICAL TECHNIQUES FOR REARING THE LARVAE OF THE SILVER CARP, GRASS CARP, AND BLACK CARP TO VIABLE STAGES, (IN RUS-SIAN), E. R. Sukhanova, G. S. Kornienko, and A. I.

Strelova

Sb Nauchno-Tekh Inf Krasnodar Fil Vses Nauchno-Issled Inst Prud Rybn Khoz. 1. p 45-50.

Identifiers: *Black, *Carps, Fertilizers, Food, Grass carp, Larvae, Protozoans, *Rearing, Rotifer, *Silver carp, Techniques, Viable.

The experimental rearing of larvae supplied by the Goryachii Klyuch Fish Farm was carried out separately by species in ponds with an area of 0.1 to 0.3 ha or in aerated tanks at the Oktyabr' skii Fish Farm in Krasnodar Krai. Fertilizers used were inorganic and combined, to which had been added horse manure or composted herbage. A con-

dition for a high yield of fingerlings is the timely dition for a high yield of fingerlings is the timely development in the ponds of rotifers, food necessary for all 3 spp. of cultivated fish at early stages of their development. The combined fertilizer favored the development of food fauna for the larvae. At a larval planting density of 0.8-1.2 million/ha, the natural food supply was underexploited. On the 13th to 14th day of rearing the larvae reached the 1st fingerling stage of development. Tank rearing is possible but requires that the rotifers and protozoans be grown separately. It is rotifers and protozoans be grown separately. It is possible to supply the larvae for 2-3 days with a nutrient mixture of 70% egg yolk, 20% milk powder, and 10% hydrolyzed yeast.—Copyright 1972, Biological Abstracts, Inc. W72-13035

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES RESEARCH IN VIR-

GINIA -- 1969-1971, Virginia Polytechnic Inst. and State Univ.,

VIRGINIA POLYCENIEC INST. and State Univ., Blacksburg. Water Resources Research Center. W. R. Walker, and T. W. Johnson. Available from the National Technical Information Service as PB-211 450, \$3.00 in paper copy, \$0.95 in microfiche. Bulletin 49, April 1972, 125 p. OWRR A-999-VA (13).

Descriptors: *Water resources development, *U-niversities, *Research and development, *Educa-tion, Training, *Water Resources Institute.

Water resources research in Virginia colleges and universities over a 3-year period is summarized and organized by institution. Indices by title, Principal Investigator, and key words are given. W72-12953

WATER CENTER ORGANIZATION MANAGEMENT,

Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. For primary bibliographic entry see Field 06B. W72-12954

9D. Grants, Contracts, and **Research Act Allotments**

WATER RESOURCES RESEARCH IN VIR-

GINIA -- 1969-1971, Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center. For primary bibliographic entry see Field 09A.

WATER CENTER ORGANIZATION AND MANAGEMENT,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 06B. W72-12954

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication **AND Distribution**

OIL SLICKS AND FILMS.

Defense Documentation Center, Alexandria, Va. For primary bibliographic entry see Field 05B. W72-12426

SUBSURFACE WATER POLLUTION: A SELECTIVE ANNOTATED BIBLIOGRAPHY, PART 1. SUBSURFACE WASTE INJECTION. Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05B. w72-12685

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For primary bibliographic entry see Field 05B. W72-12686

SUBSURFACE WATER POLLUTION: A SELECTIVE ANNOTATED BIBLIOGRAPHY, PART III. PERCOLATION FROM SURFACE SOURCES. Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

For primary bibliographic entry see Field 05B. W72-12687

SANITARY LANDFILL LEACHATE TRAVEL IN VARIOUS SOIL MEDIA--A BIBLIOGRAPHY, Vermont Univ., Burlington. Technical Information Center. For primary bibliographic entry see Field 05B. W72-12873

URBAN WATER PLANNING--A BIBLIOG-RAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 06B. W72-12921

10F. Preparation of Reviews

PROBLEMS OF EVAPORATION ASSESSMENT IN THE WATER BALANCE, For primary bibliographic entry see Field 02D. W72-12415

OCEANIC PART OF THE HYDROLOGICAL CYCLE, For primary bibliographic entry see Field 02A. W72-12416

DIRECT METHODS OF SOIL MOISTURE ESTI-MATION FOR WATER BALANCE PURPOSES, For primary bibliographic entry see Field 02G. W72-12417

A REVIEW OF LITERATURE ON TFM (3-TRIFLUOR-METHYL-4-NITROPHENOL) AS A LAMPREY LARVICIDE, Bureau of Sport Fisheries and Wildlife La Crosse, Wis. Fish Control Lab. For primary bibliographic entry see Field 05C. W72-12580

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

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 AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
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